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[OFFICIAL NOTICE.]

Twenty-seventh Annual Meeting, American Gas Light Association.

GENERAL ANNOUNCEMENT.

OFFICE OF THE SECRETARY,
NEW YORK, Sept. 7, 1899.

There will be an annual meeting of the American Gas Light Association held at New York city, October 18th, 19th and 20th, 1899. The meeting will be called to order by the President, Mr. Alex. C. Humphreys, of New York city, at 10 A.M., Wednesday, October 18th, in the meeting hall, which will be in Sherry's new building, corner of Fifth avenue and Forty-fourth street.

The headquarters will be at the Herald Square Hotel, Thirty-fourth street, between Broadway and Seventh avenue. This is a new hotel, to be opened October 1st. All members should get rooms at headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed stamped envelope should be enclosed, as misunderstandings may thereby be averted. If you write before October 5th, address Mr. C. F. Wildey, Cosmopolitan Hotel, New York city.

The Herald Square Hotel will be conducted on the European plan, and rates for rooms will be as follows:

Rooms without bath occupied by one person, from $1.50 to $2.50 per day; rooms with bath, occupied by one person, from $2.50 to $4 per day. When room is occupied by two persons the total charge in every case will be $1 more per day than when the same room is occupied by one person; that is, $2.50 for $1.50 rooms, and so on. Members of the Association occupying rooms without bath will have the privilege of using the general bath rooms, with which each floor is provided, free of charge.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name and address, etc., as these appear on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary. Remember, all applications must be in the Secretary's hands, by October 8th at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"Another View of Interior Illumination," by Mr. F. N. Morton, Hoboken, N. J.

"The Steam Consumption of a Water Gas Plant," by Mr. Alten S. Miller, New York city.

"The Pumping of Gas," by Mr. George J. Roberts, Phila., Pa.

A paper by Mr. A. G. Glasgow, of London, England; and a paper by Mr. Rollin Norris, of Phila., Pa. The titles of these last two papers

have not yet been announced. There will probably also be a paper bearing upon prepayment meters.

A lecture will be delivered to the Association by Dr. Henry Morton, President of the Stevens Institute of Technology, Hoboken, N. J., upon a subject of interest to the members.

During the days of the meeting all the announcements will be posted on the bulletin boards at the hotel and in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work by affording a ready means of recognition.

In order that the Year Book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at this meeting desire to correct their remarks before they are printed they will be given an opportunity before leaving New York city, but not after. The stenographer will have type written copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned into the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted—viz., full fare going and one third fare returning—by the several Passenger Associations named and under the conditions noted:

The Trunk Line Passenger Committee, covering territory west of New England and East of Niagara Falls, Buffalo and Salamanca, N. Y., Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg, and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis; in other words, the territory west of that of the Central Association.

[Here follows instruction by the Secretary as to the conditions under which the one and one-third fare for the round trip may be obtained. These conditions are practically similar to those that have heretofore obtained.]

SPECIAL.

If sufficient numbers of subscriptions are obtained the social programme will be as follows:

Thursday evening a banquet, to which ladies will be admitted on equal footing with the gentlemen. Friday, a steamboat ride around New York harbor. Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign enclosed card and return it to the Secretary at once. It will be necessary to have at least 200 subscriptions.

Be sure to obtain a railroad certificate when buying your ticket for New York, as the greater the number of certificates handed in the easier it is to get the reduction in rates for future meetings. Apply for ticket and certificate at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing tickets for New York. Be sure to hand the Secretary your certificate as soon as you reach the headquarters. Apply for return ticket at least 30 minutes before train time and have your certificate with you. All persons, ladies included, attending the meeting are entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present holding certificates each certificate will then be properly endorsed, and handed back to owner before adjournment.

Keep this circular in your pocket and apply to it if you are in doubt.

ALFRED E. FORSTALL, Secy.

BRIEFLY TOLD.

THE TWENTY-SEVENTH MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.—Last week Secretary Forstall's first communication, respecting the programme preliminaries for the twenty-seventh annual meeting of the American Gas Light Association, was published in the JOURNAL; and the same announcement is given to-day. Between now and meeting time, if changes in the programme are made, or if additions to its scope are decided upon, such changes or additions will be printed prominently. In this understanding it would seem desirable that those who propose attending the sessions should pay close attention to the official notices as such come out from week to week. The local committee of arrangements has had a particularly difficult task in bargaining for accommodations for the Association in respect of securing suitable headquarters, but it seems to have made a lucky hit in being permitted to name the new Herald Square Hotel as such. The "Herald" will not be ready for real business (its proprietors say their hostelry will be open for guests by October 1st) until October 10th, and the week that intervenes for the meeting will be just about enough time to enable them to "get ready" for the Association's reception and housing in smooth shape. The location of the Hotel (34th street, between Broadway and Seventh avenue) cannot be surpassed for centrality, for at that center one may readily get conveyance to any of the points on the compass of the city. The rates secured by the committee are surprisingly low, as shown by Secretary Forstall's announcement, considering that at the time of the meeting New York is certain to be "swamped" by visitors, and remembering that every appointment about the Hotel will be of the first and best order. Mr. Wildey, who is making a more ambitious attempt at hotel keeping in New York than he ever before tried, and he has been known to the writer as a boniface in one way or another in this city for well over 25 years, may be depended upon to see to it that all his gas guests are properly housed, but his labors will be lightened and their comfort will be refortified if they pay due heed to Secretary Forstall's admonition that "The most satisfactory quarters are always obtained by writing in advance to the hotel people." The place selected for the meeting room (Sherry's, southwest corner Fifth avenue and 44th street), even though it is a bit out-of-the-way from headquarters, could not be surpassed for the purpose. The assembling rooms there are simply perfection, and between the hours of the sessions, or when luncheon time arrives, if Sherry's cuisine does not suit, "just over the way" is "Del's." The paper list so far submitted is rather lean as to numbers, but is stout as to originality of subjects. Notable in the latter connection assuredly will be the paper by Mr. Alten S. Miller, on "The Steam Consumption of a Water Gas Plant," who, in his engineering management of the New Amsterdam Gas Company, has had many (and some of them peculiar) uses for steam that do not usually fall to the lot of the water gas engineer. It is, too, a satisfaction to note that Mr. Fred. N. Morton, of Hoboken, N. J., is to furnish "Another View of Interior Illumination." No doubt his writing thereon will be closely read, particularly by those interested in home lighting by electricity in New York city, for by this time the suppliers of current on such account are better convinced than ever that gas at 65 cents per 1,000 seems to take with the people. If we mistake not, the paper promised by Mr. George J. Roberts, of Philadelphia, on "The Pumping of Gas," will be on a subject not heretofore discussed publicly at an Association meeting in this country. Passing over the papers that are "promised," we come to the announcement of the lecture, by President Henry Morton, of the Stevens Institute of Technology. In reference thereto we may only print the hope that every member will be on hand to listen to his words, for a straighter, deeper scientist, a man of greater honesty or a friend of truer worth does not live to-day. And to his teachings, quiet though they have been, the American gas industry owes much more than it to-day credits. Read the circular carefully, for it has in its lines everything needful to guide those who will be with us in New York next month.

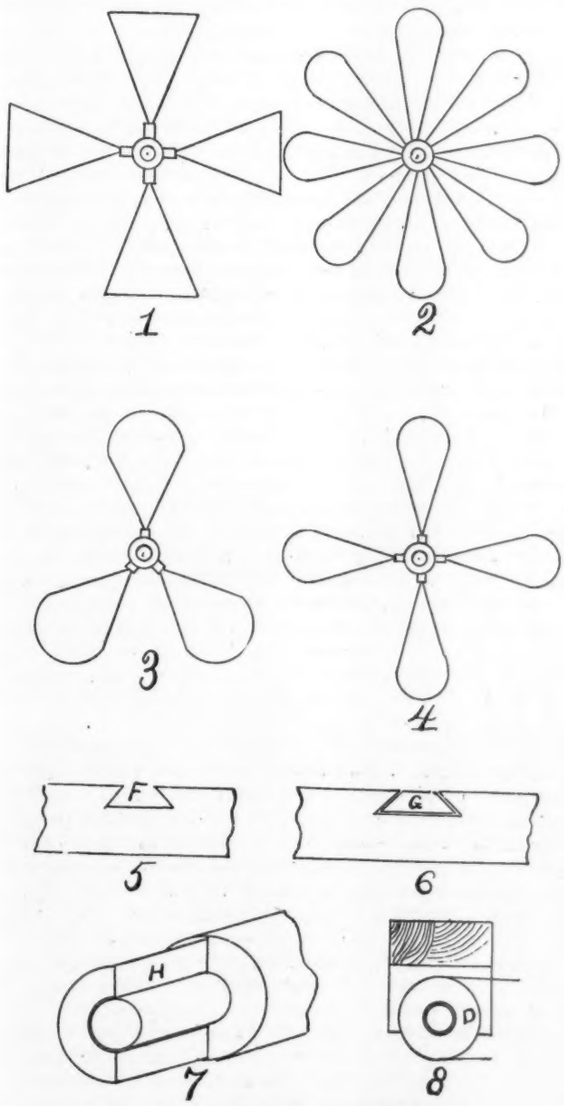
PROCEEDINGS OF THE WESTERN GAS ASSOCIATION.—We are indebted to Mr. Jas. W. Dunbar, Secretary of the Western Gas Association, for copies of the "Proceedings" of the Western Gas Association, covering its history for the years 1896-7-8. The book is a credit to the Association and to its compilers (Secretary Dunbar, ex-President Thompson and Mr. O. O. Thwing), who left nothing undone that should have been done in getting it up. It is a marvel of neatness and taste in respect of typography and binding, and the text shows how carefully the editors worked up the raw material. Bound copies of the "Proceedings" have been mailed to the members, and Secretary Dunbar desires us to say that any who failed to receive the book should notify him at once. To non-members the price of $2 for the "Proceedings" has been fixed. Secretary Dunbar's address, of course, is New Albany, Ind.

[Prepared for the JOURNAL.]

Coal Mining and Gas Machinery.

By G. D. R.

As ventilating fans are important factors in coal mining operations a few suggestions respecting them may be of value. Many fans in mine and gas work do not work right, because the discharge pipe is cramped at some point, or has too many bends or turns in it. This prevents the free discharge of air, causing a back pressure that the fan is overworked to contend with, and, of course, at so much greater expense of power and the wearing out of belts and piping at the bends or turns. The accompanying drawings show some of the forms of fans used in coal mines. To select the suitable size fan take the diameter of pipes in inches necessary to take care of each machine, add



Figs. 1 to 8.—Ventilating Fans for Coal Mines.

them up and divide by three. This will give you the diameter of inlet for fan.

The ordinary 4-blade fan is shown in Fig. 1. The blades are 24 inches from tip to tip. The width of blades at the widest part is 8 inches. If the blades are slightly curved a discharge of air equal to nearly 2,500 cubic feet of air per minute is procured with a speed of 650 turns per minute. The form of propeller in Fig. 2, in which there are six blades, same diameter as first, is only 5 inches wide at widest part. With this style of propeller, and blades set at an angle of 20°, a speed of 800 turns per minute gives about 2,250 cubic feet of air per minute. Another style of propeller is illustrated in Fig. 3, in which there are but three blades, the diameter of which is the same as in the former propellers, and the extreme width of each blade is 12 inches. Set at an angle of 17°, a propeller driven 700 turns per minute registers nearly 1,800 cubic feet of air per minute. Another pattern of air propeller is shown in Fig. 4, in which are four blades, diameter 24 inches tip to tip, and blades rounded as shown and 10 inches wide at widest point. This design of propeller develops about 2,100 cubic feet of air per minute with blades adjusted at an angle of 18°. The placing of a fan is very important, so the charge will be as straight or direct as possible, avoiding short bends or perpendicular pipes. If turns are necessary, make them as wide as possible, and for elevations give as much incline as you can. Remember, you can draw or pull around most any bend or corner, but to discharge or throw around a corner is not so easy. In the first case you coax around, and in the second you bang around, and extra force is required at every bend or turn.

Keep in Good Repair.—Recently the writer had to examine a set of pump cylinders in service in connection with a ventilating system in a coal mine. Certain strange scraping noises came from the pumps. An examination developed that some time before one of the packing rings of one of the pumps had broken, and the sharp end had been forced into the interior of the cylinder, cutting or tearing out a groove. The cylinder was taken out, put into the proper devices in the machine shop and a V-shaped groove, like *F*, Fig. 5, made the length of the cylinder. Then a brass beveled key was made the same shape of the grooved seat and this key was driven into the groove, like *G*, Fig. 6, smoothed over with emery and pinned, and thenceforth the strange noises ceased.

Bearings.—The bearings and the studded connection of a fan are the only ones usually causing the most trouble. The oil is usually poured over the parts, and, after having been gummed with foreign matter, clogging results. The remedy does not consist in a change of oil, but in a cleaning of the parts, and, if possible, boxing them, so as to keep out the flying of dust from the mine. Usually the grit and foreign stuff collect at *H*, Fig. 7, and unless removed will cause considerable trouble by cutting the metal. Another thing we should look after is the belting which drives the fans.

A Dangerous Combination.—An insurance man called my attention to the combination of cut beam and a set of wood belt guiding rolls, *D*, presented in Fig. 8. This was in a coal mine where fine dust was always in the air and the chances for a fire very great. A beam was cut out for a large belt and, to save the belt, a number of wood rolls on steel shafts were fixed into the opening. These rolls were spun around with great speed and actually smoked, although oilsoaked. The company was compelled to remove this affair, and accomplished the same ends, so far as providing transmission for the belt, by cutting into the beam a little more, so as to entirely remove the rolls.

Care of Pipes.—All clamps and pipes not in constant use should be provided with covers so the air can be shut off when not in use, as it is economical in power to do so. A fan will handle so many cubic feet of air per minute, according to size, speed, etc. It is just like a pump in that, when all the pipes are full, it can handle no more under existing conditions, but if you close or shut off one pipe it will increase the pressure or quantity or velocity on the remaining ones.

Rim Wheels.—On old fans the grooves of the rim pulleys are sometimes worn, and a ridge or shoulder formed on them, which prevents the band from getting down to its proper place in the groove. When this is the case, it cannot bite or grip as it should do, even when the band is sufficiently tight. When this feature is suspected an occasional examination and the removal of those that are found to have these ridges on them will suffice to remedy this. This naturally applies to the pulley on the cylinder shaft as well as to the rim pulley.

The Guide Rolls.—When the guide rolls are dirty, or waste is collected, this takes the weight off one boss and causes bad work. The same thing occurs when the bottom rolls get into this condition; and when waste is allowed to accumulate on the working part of the back steel roller, it increases its diameter at that part and causes trouble. The evident remedy for this is thorough cleanliness. When the bottom rolls have their working surfaces cut or indented, they should be fixed. And when their flutes or corrugations are worn too much the top rollers have a greater liability to slip, since their motion is obtained only by friction, and this liability is still further increased when they require oiling or are dirty. The guides of the roller traverse motion also require to be kept clean and not allowed to become too much worn. When the bottom rolls get crooked or strained from any cause they jump when working.

In conclusion, I would say that although some may perhaps assert that some parts of this essay are a little too abstract and theoretical, still it cannot be doubted that a knowledge of the elements of the theory is of very considerable value to those who are mainly concerned with practical results; and I have tried to put these remarks in such a practical manner as will be readily understood by those deserving men

who are striving to climb a little higher up the ladder of success. Technical education is behind in this country in the subject of coal mining, and shortly we in America shall awake, as did our cousins across the water a few years ago, to its importance. Always remember that everything must be done systematically. Oil and clean mining machinery at regular intervals, have every part of your department, whether you are a workman or an overlooker, doing all that it was intended to do, and have nothing stopped. Take as your precepts (and act up to them) "Perseverance conquers all things." "Attend to details;" and "The end of all government is order."

[No. II.—Continued from Page 411.]

Differential Rates as Between Consumers of Gas for Lighting and for Purposes Other Than Lighting.

By "A Gas Engineer," in *Jour. of Gas Lighting.*

Arguments based upon extreme cases, such as *may* occur, but if they *do* happen at all are so rare as to partake rather of the exception that proves the rule, may serve the purpose of a partisan; but they do not aid in the broad general view that should be taken, if the rights of all parties are to be considered, rather than those of one only. And the *reductio ad absurdum* style is always effective. Yet there is nearly always another side to the shield, though it may be momentarily obscured by a cloud of ridicule. Before laughing at the ignorant old woman who buys 12 and sells 13 at the same price, it is well to hear an explanation of the matter from her side of the counter. We may find that her head is screwed on the right way after all. The wisdom of throwing out a sprat to bring in a mackerel is generally recognized in trade. Possibly she has a scheme of this sort in view; and by some obscure but perfectly feasible means, she may manage to show a balance on the right side of the ledger at the end of the year. She may sell for cash and buy on long credit, or pay in kind and not in cash, having a cross account with the egg merchant which leaves her a good profit besides covering the loss on the eggs. The idea of selling butter at two different prices according to a foolish and whimsical rule, is no doubt absurd; and, like the other example, it is by no means on all-fours with the practice of offering gas at special rates for special purposes. In every town, however, there are grocers who supply butter to schools, hospitals, or other public institutions, at prices lower than those paid by the casual purchaser of half a pound; and 99 out of 100 grocers would not hesitate for a moment, if satisfied that there was money in the transaction, about supplying the ordinary 14d. butter at 1s. or less under special contract. Let us suppose that the man who relishes buttered teacakes, but not the idea of someone else getting a supply at 2d. per pound cheaper than himself, calls upon the grocer to remonstrate. We can even imagine him quoting some of the passages from Mr. Newbigging's paper, simply substituting 14d. butter for "gas for lighting." The grocer's reply would probably take this shape: "If I like to give up 2d. per pound off my fair profit, how does that affect you?" It is also quite possible that the grocer, by securing a large contract at 1s., may be able to buy so much more advantegeously that he can supply the ordinary customer at 1s. 1d., and thus benefit him while at the same time receiving the old rate of profit. The windows of the shops in our principal towns abound in notices such as "Discount on club tickets," "One shilling in the pound allowed on club tickets," "Railway fare paid to customers from a distance," "Orders over £2 delivered free," "Discount for cash," and other announcements which partake of the nature of differential rates, or of selling similar articles at 1s. 2d. to one and at 1s. to another customer. But the railway business of the country comes nearer to the gas industry, in respect to financial working and division of profits, than the retail shop. Here is a splendid field for Mr. Newbigging, as the traffic, both passenger and goods, is simply saturated with differentiation, and of charging, not two prices, but half-a-dozen for the same service, and of selling the nominal 14d. article for anything down to 2d. If I desire to visit a certain seaside resort about 60 miles away, I can do so at ordinary fare for 10s. return; but at this season of the year I can get a tourist ticket, and so secure the same service for 8s. 9d. If willing to return the same day—a condition that does not affect the cost price of the service—I can get the same thing for 3s. 6d. By chartering an excursion train, and guaranteeing 500 or 600 passengers, lower terms could be obtained. Then there is a competent railway company whose route is 50 per cent. longer, but who quote similar rates to the above, though the cost price must be greater; so that I can, if so inclined, follow the example of the Irishman who travelled by the slow train because he got more time for the same money. Similar examples could be quoted from the goods tariff, of rates that differ according to a variety of circumstances.

This condition of things is not the result of deliberate choice on the part of the sellers, but has been forced upon them by competition and by the desire to keep their capital fully employed. A tradesman who announced "One fair, honest price to all," might spend his time in contemplating empty chairs, while his neighbor who puts up "Unheard-of-bargains," "Desperate sacrifices," and otherwise leads the public to imagine that he is selling at a dead loss to himself or somebody else, has his shop crowded from daylight to dark. If there was a free distribution of Fortunatus caps, the old lady would select a steady sale of eggs at 9d. per dozen, the grocer would meet his large contract at full retail prices, the railway companies would have one all-round tariff at the top rate, and the "87" would have a summer and day consumption sufficient to keep their staff and apparatus fully employed, all at the nominal price with no discounts or abatements.

They have not adopted differential prices from choice, as an improvement on the all-round price, but the matter has been forced upon them, as a means of retaining lines of business that show a tendency to drop off, or of securing others that are at present not attainable. Mr. West, I think, ridiculed the idea of price having much to do with consumption for purposes other than lighting, and talked about people who used gas stoves when gas was 12s. per 1,000 cubic feet. The general experience is that the lower the price the greater the day and summer consumption. This desirable line of business did not find general acceptance while gas was over 4s. per 1,000 feet. As many gas managers have found, the general use of cooking stoves does not set in till the gas is reduced to about 3s.; while for gas engines the limit is lower still. Differentiation is a very general remedy for partial or total slackness of trade, and desperate cases are met with desperate measures. The supply of electricity is a case in p int. Electricians soon found that the prospects of business on a steady all-round rate of 6d. to 8d. per unit were limited. So all sorts of arguments about load factors, average daily consumption, and so on, had been brought in to account for the complicated schedules of prices that form a sort of sugar coating for the objectionable pill. Many of these show a range of 400 to 500 per cent., and are so replete with carefully prepared phrases of the catchpenny character that the only intelligible idea they convey to the customer is that his supply of electricity will be gloriously cheap. In some parts of the world, gas is of necessity priced at 10s. per 1,000 cubic feet or more; and under these circumstancet the rate differential is much more general than where, as in most of the large towns in the United Kingdom, gas can be sold at one-fourth the price. Under ordinary prices for gas the differential rate, if it exists at all, takes the mild form of a 10 or 15 per cent. discount or rebate.

Mr. Newbigging attaches some importance to the fact that the 87 are selling at comparatively high prices, and blames this to their erratic administration; thus inferring that if they had kept to a steady single price, they could sell gas as cheaply as others. I submit that this is a mistake, and that the differential price is the effect, and not the cause. Why should the South Metropolitan, the Plymouth and other undertakings who can sell cheaply and consequently have a steady trade, need to consider differential rates or other means of stimulating business? Or, in a general way, why should undertakings situated almost on the top of coal mines. and getting coal put into the works at something less than 10s. per ton, concern themselves with questions of this sort?

The cheap coal alone is sufficient to guarantee a good manufacturing industrial neighborhood, and to give them quite enough to do in meeting the natural increase. Their prosperous consumers are only too glad to get gas for cooking, heating or motive power at anything less than 2s. 6d. per 1000 cubic feet, and thus avoid the troubles incidental to solid fuels. But the case is different in localities where coal costs 20s. per ton, and which consequently abound in empty factory buildings, and possibly show a decreasing population. The few struggling industries that are carried on are already heavily handicapped by cost of fuel and carriage of raw material and finished goods; money is not plentiful, and people look carefully after their expenses and do not attach the value to the saving of time and trouble secured by gaseous fuels that is so highly appreciated in busy, thriving districts. These places are especially liable to suffer from excess of capital. In building a new works, or in providing extensions, a reasonable excess is always allowed for future development. A gasholder, for example, cannot be built in halves, and a 400,000 cubic feet capacity only costs 10 per cent. more than a 300,000 cubic feet capacity. In the thriving district the normal rate of increase is, if anything, exceeded, and the excess is soon taken up; but in the second case we may have a

stationary business, or one that is actually going back. It is in such instances that the differential rate is resorted to with success as a means of securing an increase of business that cannot be otherwise obtained. Before condemning any undertaking for introducing differential rates, the local price of coal, the capital per 1,000 cubic feet of gas sold, the sales per annum for the past five years or so, and other circumstances, should be considered.

An example of a company selling, as most companies do, at very little more than "cost price" (using the term in the new acceptation adopted by Mr. Newbigging), is given in the paper; and the deduction is drawn that differential rates could not be adopted in that case without injustice. But some years ago the writer advised an undertaking similarly situated to allow a rebate of 7d. per 1,000 cubic feet as a means of introducing gas engines. Though there was a 100,000,000 business, the largest gas engine in the district was 2-horse power, and the consumption in this line was not worth notice. The selling price was then 3s. 4d., at which rate the manufacturers said, and with truth, that they could not afford to use large quantities of gas as fuel. In a short time, about 40 gas engines were in use (the largest being of 24-horse power); and this meant an additional 5,000,000 per annum. The profit on this business, which called for no extra outlay beyond one or two lengths of main, and gave no trouble from "overlap" in the winter, was a material help in bringing about a general reduction to 3s. 2d. As to the rebate helping to keep up the gross price, it represented only about ¼d. per 1,000 cubic feet on the whole sales; but of this not a fraction has been indirectly paid by the consumers. It is saved by the fact that the establishment charges, and the expenditure per consumer and per mile of main, remain the same, and are not increased beyond the limit that they would stand at in the absence of any gas engine business. In fact, the saving is sufficient to leave a surplus for the profit and loss account that is available for dividends, and therefore assists towards an all-round reduction of price. I do not wish to occupy space with a large number of examples; but this is not an exceptional case. In one instance, the all-round position of the concern was greatly benefited by offering, as an inducement to take stoves, to allow a discount on the increased consumption, as ascertained from a 3-years' average.

(To be Continued.)

[Concluded from Page 415.]

Water Power Electrical Plants in the United States.

[A paper read by MR. B. C. WASHINGTON, JR., before the Electrical Section, Franklin Institute.]

Mechanicsville-Schenectady Power Plant. — The Mechanicsville-Schenectady Power Transmission Plant has been described with considerable detail in the leading electrical journals, and is no doubt, by reason of its importance, quite familiar to all present. This plant is only 17 miles distant from the city of Schenectady, where are located the largest electrical works in the world, covering about 130 acres of ground. To this city the water power of the Hudson river is transmitted electrically, and utilized by the General Electric Company in the manufacture of electrical machinery.

The site for the dam and the power house, where the banks and bottom of the river are of rock, seems to have been designed by nature to meet the requirements of the most exacting engineer. The water power is sufficient to produce from 8,000 to 10,000-horse power for the greater part of the year.

Bluff Island divides the Hudson into two channels. The power house starts from the west bank and extends out into the river about 215 feet, and is connected with Bluff Island by a concrete dam. On the eastern side of the island is the main dam, which is built entirely of concrete. The up-stream face of the dam is vertical, the down-stream face is curved, and the horizontal apron, 14 feet wide, throws the water off horizontally, and prevents scouring of the toe of the dam.

The abutments are anchored to the rock sides of the river bank and the island. The spillway between the abutments is 800 feet long. In the western abutment are 12 arched waste gates, each 4 feet wide and 6 feet high. A floating wooden boom anchored to a line of stone cribs above the dam prevents floating rubbish or ice from choking the waste gates.

The foundations of the power house are carried down to bed rock, and the house is carried on steel box web girders resting upon steel I beam columns. These columns are imbedded in concrete walls carrying arches spanning the tail races and forming the floor of the generator room and the wheel flumes. Division walls form a separate and distinct tail race 22 feet wide for each set of turbines, from which the water can be shut off at will. A thick headwall divides the house into two parts. The up stream part contains wheel chambers for seven 1,000-horse power wheels and two exciter wheels. The down-stream part contains the water wheel governors and the generators and switchboard. The power house is 257 feet long; the wheel room is 32 feet wide, and the dynamo room is 34 feet wide. A 20-ton crane runs the length of the dynamo room.

Each main turbine consists of two pairs of 42-inch horizontal Victor turbines, built by the Stillwell-Bierce & Smith-Vaile Company, of Dayton, O. Each set of four wheels is rated at 1,000-horse power under an 18-foot head. The turbines for each exciter consist of three 18-inch Victor cylinder gate wheels (arranged as a pair with a central discharge and one single wheel), developing a total of 300-horse power at 259 revolutions per minute. The speed of each set of main wheels is regulated by a Geissler electro-mechanical governor placed on a platform over the turbine shaft and between the head-wall and the dynamo. These governors can move the gates through their full travel in six seconds. Snow governors control the exciter wheel gates.

The generators are 3 phase, forty pole, 750 killowatt General Electric machines, having internal revolving fields and stationary armatures, wound to deliver 36 amperes of current at a periodicity of thirty eight cycles and at a potential of 12,000 volts to the transmission lines when running at 114 revolutions per minute. The armature frame is 15 feet 4 inches in diameter and 36 inches wide. The field ring revolves on a shaft 15 inches in diameter, rigidly coupled to the turbine shaft. On each side of the stairway leading to the switchboard gallery are located the exciters. The switchboard consists of nine panels. Five are used for the generators, two for the feeders, one is the total output pannel, and the ninth is fitted for the control of the exciters. The details of the switchboard equipment are interesting, but it will take up too much time to enumerate them. In a small house near the first pole are placed double pole 2,000-volt, short gap lightning arresters, connected six in series to give the necessary number of spark gaps, which are each $\frac{1}{17}$ inch long. The line consists of three No. 000 B. & S. bare copper wires. The circuits are carried on poles 30 to 60 feet long, 8 inches in diameter at the top. Triple petticoated insulators are used.

All of the machinery of the General Electric Company in their Schenectady plant is driven by electric motors, so that the change from steam power on the ground to water power, developed and transmitted 17 miles, will not necessitate many changes. The steam plant will be retained as a reserve in case the water power should fail.

The General Electric Company furnished all of the electrical equipment. The Stillwell-Bierce & Smith-Vaile Company, of Dayton, O., were entrusted with the entire development, taking the river in its natural condition and building the plant, turning it over to the operating company in thorough running order, having used throughout hydraulic equipments of their own manufacture.

Coupling Water Wheels and Generators—Miscellaneous Applications of Electricity for Power Purposes.—I invite your attention to some views illustrating the methods employed for coupling water wheels and generators, and also the very wide range in the application of electricity for power purposes.

Of interest are the two 450-kilowatt 3-phase General Electric generators of the Portland General Electric Company, at Portland, Ore. They are driven by vertical turbines made by the Stillwell-Bierce & Smith-Vaile Company. The weight of the vertical shaft, with the armature, is about 33,500 pounds, and to carry this a system of extra bearings is introduced, one of the ring-thrust type, and the other a hydraulic oil bearing, both supplementing the ring bearings on the armature shaft. They are enclosed in cases filled with oil, delivered by hydraulic pressure, and are surrounded by water jackets. The generator shaft is 29 feet long and 8¾ inches in diameter. Direct current exciters are used for the 3-phase generators. The direct current for the railway service is obtained by means of rotary converters. Each converter delivers 500 horse power to the bus bars of the continuous current switchboard.

At the St. Anthony Falls water power plant, several 700-kilowatt 3-phase generators furnish the current for operating nearly 240 miles of street railway in the twin cities of Minneapolis and St. Paul. The apparatus seen belted to generator No. 8 is a Lombard water wheel governor. The Lombard governors are used with the other turbines which drive the generators.

The power plant of the Pioneer Electric Power Company, of Ogden, Utah, is also worth noticing. The water wheels are of the impulse type, and are directly connected to the generators. Under an effective

head of 416 feet the wheels have a capacity of 1,200-horse power each at 300 revolutions per minute.

A ‡ inch steel pipe 24 inches in diameter conveys water under a head of 1,411 feet (having a pressure of 609 pounds to the square inch) to the 60-inch Pelton water wheels, which drive the generators of a light and power plant. Three 3-phase 350-kilowatt G. E. generators are driven by the large Peltons, and three small Peltons operate the exciters. The current is generated at 700 volts, and nine 125 kilowatt transformers raise the voltage to 11,500 volts, at which voltage it is delivered to the transmission line.

At the Electric Light Company, Columbus, O., Leffel Cascade 18-inch water wheels of the impulse type are direct connected to the generators. The six generators of the Boise electric light plant are driven by a 26-inch double discharge Leffel turbine, with six clutch pulleys. Any one generator, or combination of them, can be run at pleasure. The generators of the Skowhegan Electric Company, Skowhegan, Me., are driven by two 56-inch Leffel vertical turbines, which operate under 13 feet of head. The power station of the Electric Light and Power Company, at Raritan, N. J., operated under a head of 13½ feet, is driven by 40 inch wheels of the same make.

A point which I wish to illustrate is that the use of vertical turbines and heavy gearing is necessary when the fall is not great and waste of water is not permissible. Thus, I show you an installation in which the turbines are belted to pulleys on the main line shaft extending the whole length of the wheel room and continuing through the partition walls into and along one side of the generator room of the power house of the Ponemah Mills, Taftville, Conn. This power house is located at Baltic, 4½ miles distant from Taftville. The pulleys are put into, or out of, action by clutches mounted with pulleys on quills, so that any one, or all, of the wheels can be applied to driving the shafts.

The belted generators are G. E. 250 kilowatt 3 phase generators, which deliver current to the line at 2,500 volts. At Taftville the 3-phase circuits are led into the basement of the mill, where they drive two 3-phase synchronous self-starting motors. These motors furnish power for driving the 1,700 looms, the lighting plant and three 80-horse power G. E. railway generators. This was the first important application of electrical power transmission to textile manufacture.

In the Carolinas and Georgia are many valuable water powers, and capital has been steadily invested in these powers during the last five or six years, and several notable electrical developments have been made.

I have some interesting views which show only a very small portion of the largest and greatest water power development on earth. You know, of course, that I refer to the enduring monument to engineering skill and genius built at Niagara Falls by the noted engineer, Dr. Coleman Sellers. No hydraulic and electric plant was ever built where such tremendous engineering difficulties were encountered at every stage of its progress, and yet, thanks to the genius and perseverance of the engineers employed in the different branches of the development, every difficulty was promptly met and perfectly solved. This plant has been very ably written up and profusely illustrated in the edition of *Cassier's Magazine* for July, 1895, and was made the subject of two numbers of the *Electrical World* in January, 1899.

The speaker here showed a number of views illustrating the exterior and interior of the Niagara power plant.

The Pelzer Manufacturing Company, at Pelzer, S. C., one of the largest manufacturers of cotton goods in the South, has a well equipped electric power plant. The transmission plant consists of three pairs of 60 inch turbines, made by the Stillwell-Bierce & Smith-Vaile Company, direct connected to three 750-kilowatt 3-phase G. E. generators, wound for 3,300 volts. The power is carried three miles to the mills. The motors consist of one 400-horse power synchronous motor, wound for high potential, fifteen 110-horse power, four 75-horse power, two 50 horse power, one 20-horse power, and four 5-horse power, a total of 2,530-horse power. Most of these motors are of the inverted type, and are suspended from the ceiling, and receive current at low potential from step-down transformers, located in the sub station at the mills. The mills are lighted by 1,200 incandescent lamps from the same power. The electrical equipment throughout the entire plant was furnished by the General Electric Company.

The electric plant of the Columbia Mills Company, of Columbia, S. C., also deserves notice. Two pairs of 48-inch horizontal turbines, made by the Stillwell-Bierce & Smith-Vaile Company, operated under 26 feet head of water, develop 2,000-horse power. One 24-inch wheel under the same head develops 190 horse power, making a total of 2,190 horse power. This power drives two 500-kilowatt 3 phase generators, direct connected to the turbines, running at a speed of 108 revolutions per minute. The power is transmitted a distance of ½ mile to the mills, and there drives 1,775 horse power of inverted motors, and these motors operate all of the machinery of the cotton mills.

These two plants illustrate better than words the advantages derived from the electrical development of water powers, especially when the powers are utilized for manufacturing raw materials raised at the very doors of the mills. In the cases of these mills in particular a large saving is made in the cost of power, and the use of individual ceiling motors dispenses with many feet of power wasting shafting, and also saves a large amount of valuable floor space. The absence of many yards of belting gives better light to the employees in the building and lessens their chances of being accidentally injured. Another point to be scored is the cheapness of living and the low cost of labor in the locality of these mills.

That this locality is a splendid field for the investor is shown in the interest taken by the Government in having all the water powers in this section accurately measured. A very complete report has been published on "The Progress of Stream Measurements" by the U. S. Geological Survey. This publication very materially strengthens the views I advanced a few years ago; that this section offers splendid opportunities for a water power development company. Such a company could buy the best powers and develop them at leisure. The cost of such developments would be exceedingly reasonable, since timber for buildings and pole lines and stone for dams are to be found wherever there are powers. There are many other features worthy of consideration, such as the building of factories for manufacturing many articles that are now brought to this section fram a distance. Land about the factories would also be available for town sites, so that the original outlay would be gotten back In a few years.

There is little question but that powers not immediately developed would increase in value more rapidly than interest would accrue if the capital were invested at the present low rates of interest that are being paid on large sums of money.

A few statistics relative to water power electric plants may be of general interest, and, since they were obtained after the expenditure of considerable time and labor, I will try and present them in such shape as not to weary you.

In the first place, the method employed for securing accurate and reliable data was by personal correspondence with the electricians in charge of the plants, a list of the plants operated by water power having been furnished me by the different manufacturers whose machinery was used in the plants.

There are nearly 500 water power electric plants in the United States, representing an investment of over $60,000,000. The total horse power represented by water wheels is over 200,000. The power is furnished for lighting 28,000 arc lights, 845,000 incandescent lights and for operating about 60,000 horse power of motors. There are over 610 miles of electric street railway operated by water power electrically transmitted.

The geographical location of the plants shows that the water powers have been electrically developed in proportion to the powers available. New England has no coal fields, but it seems that Providence has supplied this portion of the country with numerous large water powers. Of the 312 plants from which I have received reliable data, 115 are located in the States of Maine, New Hampshire, Vermont, Massachusetts and New York. Michigan has twenty-six, California twenty-five and Colorado eleven. The other plants are distributed among the other States.

It seems to be fairly well established that it pays to develop water powers from 50 horse power and upward, and that additional steam power is necessary when the water power is not sufficient to do all the work, and is not reliable at all seasons of the year. It is a well-settled fact that at the present time power can be profitably transmitted up to 80 miles and utilized for any purpose for which steam power has been applied. In mining localities it has made possible the profitable reduction of low grade ores that could never have been mined had steam been the only power available, owing to the enormous cost of coal and the difficulty of transporting it from the nearest point on railroads to the mines. In short, we find that our inventors have produced water wheels, dynamos, motors and transformers of the highest efficiency; that governors regulate the water wheels with the greatest precision; that insulators are made to safely carry currents of enormously high potentials, and that perfect protection is afforded the electrical apparatus from electrical disturbances caused by lightning.

Not until all electric light and power stations are equipped with total output wattmeters and accurate books are kept, showing the exact amount of fuel used and all of the expenses of operating the plants,

will satisfactory data be available for comparing the cost of producing current by the two methods—water and steam. When sufficient progress has been made in adopting uniform methods of keeping station accounts, and accurate and reliable data can be secured, it is my purpose to obtain and publish comparative statements showing the cost of producing current by the two methods.

[The subject of the paper was profusely illustrated with the aid of stereopticon views.]

The Bauer By-Product Coke Oven.

By means of the accompanying illustrations and description, which originally appeared in "Stahl und Eisen," *Engineering and Mining Journal* shows a new form of retort coke oven, devised by Dr. von Bauer, which has been adopted by the firm of Fried. Krupp after a year's trial at the Hanover Colliery owned by the firm. In the illustration Fig. 1 is a cross section through the center; Fig. 2 is a longitudinal section; Fig. 3 is a section through the center; Fig. 4 is a section through the flues; Fig. 5 is a partial section, on a larger scale, through the top of the flues. It is known that most varieties of coal contain more gas than is required in order to transform them into coke; hence, not only is all the gas unnecessarily consumed, but also air is admitted towards the end of the process through the peepholes in the

FIG. 1.

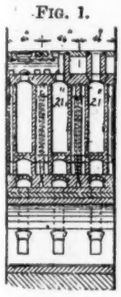


FIG. 2.

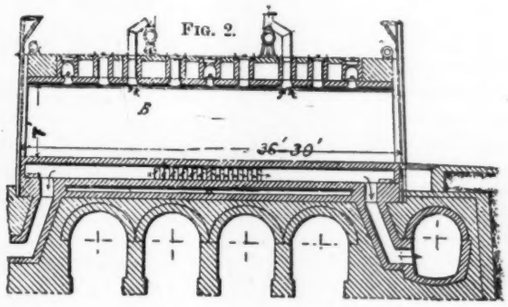
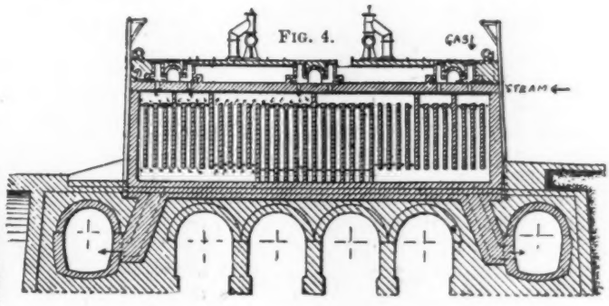


FIG. 4.



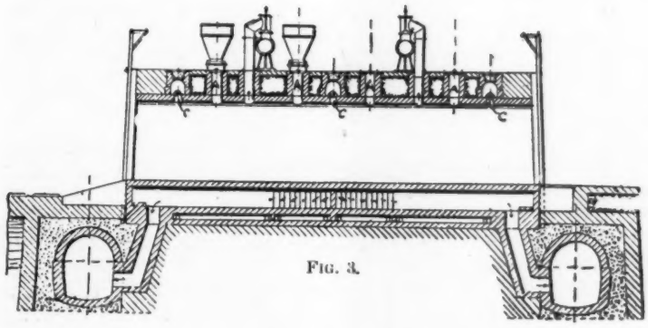


FIG. 3.

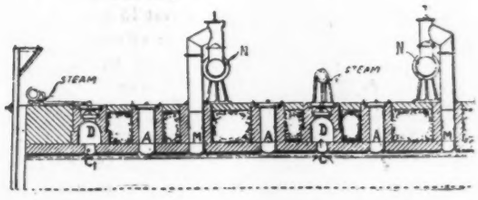


FIG. 5.

doors, which helps to lower the temperature at the expense of the charge—that is to say, that at the commencement there is too much gas and too little air, and at the end of the process the reverse condition obtains, notwithstanding that the whole of the gas is consumed. It is a very difficult matter to regulate the supply of air and give the proper dimensions to the gas flues. If, however, there is a means of supplying the gas in a uniform manner these defects are removed, and in addition there is a surplus of unconsumed gas, which is of more value than spent gas. The system under consideration enables one to heat the air in an equally uniform manner, and to increase the supply of air and gas as the increasing temperature of the oven renders it necessary, thus adapting itself to the exigencies of the coking process, which at first requires less and later more of air and gas.

The method can also be applied to the ovens with by-product recovery in which gas is delivered in uniform quantities from the gasometer.

A glance at the accompanying drawings, and the perusal of their description, will show that the Bauer oven can be worked (1) as an ordinary oven; (2) as an oven with condensing apparatus; (3) as an oven worked on the duplex principle, viz., of abstracting the gases during that period in the process when they are most rich in by-products, and allowing subsequently the less valuable gas to pass, without being cooled and afterwards rekindled, direct into the flues. By this method an economy of both heat and of gas is effected, and the cost of the by-product plant is reduced, as the hottest and poorest gas is not treated.

The Bauer ovens will take a charge of from 9 to 10 tons, and the average coking time is from 30 to 36 hours. Considering their output it is claimed that they occupy less space, and the cost of working is less than is the case with some of the other systems.

The ovens are filled through the charging holes (*A*), unless it is preferred to introduce a pressed or pounded cake of coal with the aid of machinery, and thus do away with these apertures.

1. When used without by-product recovery the valves to the exhauster are closed and the stones that close the main flues are open. 2. When used with by-product recovery apparatus the valves to the exhauster are open, and the stones that shut the flues are down. 3. The duplex principle of working is when methods 1 and 2 are combined, viz., at first with and afterwards without by-product recovery. When the oven is without the by-product system the gases reach the main flues, *d*, through three apertures, *C*, and from these pass on to the combustion flues, *E*. With the by-product recovery plant in operation, the purified gases from the gasometer pass into the mains, and from thence into the flues through six openings. With the union of the two methods, the gases from the gasometer mix with those of the ovens in which the exhauster is not working, and then flow into the flues through six apertures. In each case the flues receive gases or gas mixtures of uniform composition—either the crude gas disengaged at each particular phase of the coking process, or the return gas, or else the return gas mixed with the gases of the ovens that are in operation.

The gases enter at the top ends of the ovens, pass downwards, then underneath the bottom of the flues, then upwards, and finally, having received an addition to their quantity from the mains, pass once more in a downward direction in order to reach the bottom flue, situated in the middle of the oven, and thence flow to the boilers through the outlet pipes. The ovens operate therefore on both sides—namely, from the ends towards the center—and there are on that account two inlets for the gas. Below the combustion flues there is situated, between the air flues which are underneath the bottom flues of the oven, a main air flue; this receives from outside and from the air flues both cool air and hot air. This air passes up through airways which are located between the combustion flues, and, then through certain small ports, reaches the gases, which, from the main flues have passed into the chamber above the gas flues. The coal in the oven is on a level with this chamber where the gas and air are comingled. In places where the gases flow in a downward direction the previously heated air is introduced through small holes underneath the flues, and in order to admit fresh air certain small air passages are effected in the top of the oven or of the air chambers.

In each half of the oven in the gas flues the fresh air is admitted from below twice and emitted from above as hot air, and once from

above to be emitted below in the same condition. Those surplus gases which are not consumed in the combustion flues pass direct from the mains, previous to ignition, into a transverse duct, which for every 10 retorts connects the three mains together, and from this duct pass through the main outlet to the boilers, or reach the latter by a separate conduit in order not to become mixed with the spent gases. Parallel with the return gas pipes there run steam pipes for the purpose of moderating, in case of necessity, any excessive temperature in the gas mains, or in order to maintain any particular degree of heat that may be desired. These pipes, which are of small diameter, and are placed above the oven, are furnished at certain intervals with nozzle-shaped branches, furnished with taps that lead into the mains. The position of these steam pipes is shown in the elevation, although they are too small to be distinctly indicated.

The battery of Bauer ovens consists of eight, with a capacity of 9 tons. The coal used contains 12 per cent. of water and 67 to 69 per cent. of fixed carbon and ash. The coke yield was, taking the average of the year during which the ovens were worked experimentally, 73.2 per cent. Batteries of some other systems in the vicinity were worked with precisely the same coal, and the highest yield of the old or the most recent ovens was 68 per cent.

The normal coking time for one of Bauer's ovens is 30 hours. For about two months it was from 32 to 34 hours, and for the rest of the time—as special men were not told off to attend to so small a battery—the time has been 48 hours, as soon, however, as the new installation is complete the period of 30 hours will be adhered to.

An oven with 48-hour charges will yield in one year (360 days) 1,186.5 metric tons of coke, and with 30-hour charges it will yield 1,898.4 tons of coke—that is, when worked without by-product apparatus. The the oretical yield of coke has been given above as 67 to 69 per cent., or as smaller than the actual. Such discrepancies are, however, not infrequent. At Creusot, in Bauer's vertical ovens, working with a mixture of coal and anthracite, we have a yield of 81½ per cent., although theoretically the coke contents are put down as 82 per cent.; at the Hanover Colliery we have a yield of 4 per cent. above the theoretical one as before stated, namely 73.2 per cent. It is, therefore, not correct to merely indicate the charge for 24 hours in instituting comparisons. The excess of over 4 per cent. above the theoretical yield has been maintained by Bauer's ovens regularly throughout the whole time they have been in operation—that is to say, for about 15 months; and these figures are not simply the result of an analysis effected in the laboratory, but have for their basis the total amount of the coke production since the ovens started working. At the Hanover Colliery Professor Dr. Kassner, Dr. von Bauer and others, are of opinion that this excess in the yield is due to the precipitation of volatile carbon, which is absorbed by the glowing coke in the last stages of the process. Notwithstanding the experiments of Kassner, many are skeptical on this point, and further investigations are to be made. The fact of this excess of the yield above the estimate is, however, well established.

The advantages claimed for these coke ovens are the surplus of gas unconsumed, the smaller space that they occupy, the low working expenses and the absence of any smoke.

Direct Alternating Generators.

By Mr. Alton D. Adams, in *Elec. World.*

The grounds of contention concerning direct and alternating currents have changed, but there are still differences of opinion to be settled. The question now is not so much whether to employ direct or alternating current in central station work, as it is where to employ each to the best advantage.

Many engineers now hold that alternating currents are superior for transmission and direct currents better for distribution, but the question remains as to where transmission ends and distribution begins. Again, it is said that direct current distribution is better suited to that part of the load which is grouped near or about the station and alternating current more available for load further away or in outlying districts. To many minds it is quite clear that a heavy compact load near the station can be more cheaply served with direct current, and equally certain that a distant load can be cared for at less expense with alternating current.

At an earlier date in the development of the central station industry the decided differences of opinion concerning direct and alternating currents usually resulted in the selection of the one to the exclusion of the other in a given station system, but the later views tend to the use of both currents from the same plant.

Purely direct current stations are looking to-day eagerly toward valuable loads beyond their economical radius of supply, and not a few alternating current stations would gladly escape the disadvantages of the transformer system in their heavy, nearby loads.

Managers see in the alternating current a longer arm for business, and in the direct more economical operation of heavy adjacent loads. So much for incandescent lighting, but there are the motor and arc lamp loads to be cared for.

In spite of the development of alternating current motors and their extending application it seems certain that the direct current motor is here to stay. A very large part of the power now distributed by electric motors in the United States, probably 80 to 90 per cent., is used in the direct current type; and there is small prospect that stations supplying direct current to heavy, compact load areas will change to alternating supply for motors. Moreover, the investment of consumers in tens of thousands of direct current motors, which is being augmented by the daily output of a score or more factories making only direct current machinery, is a factor of enormous weight against any change that would send these motors to the scrap heap. It being conceded that direct currents will continue to be used in large measure for power distribution, their production is another problem to be considered in connection with changes in central station design.

It may be said that as a large per cent. of direct current motors are now operated from incandescent lighting mains, the remainder of this class of motors may be so operated and power beyond the radius of these mains supplied from alternating current motors, but there is much doubt whether this plan can be carried out in practice so long as direct current mains remain at about 240 volts pressure. Direct current motors supplied with current from central stations are in almost all cases operated at about either 240 or 500 volts pressure, and the 500-volt motors are in many cases much beyond the distance from supply station at which power at 240 volts can be economically delivered. Should the 220 volt incandescent lamp come into general use, as is to be hoped, there is good reason to think that all direct current motors from central station supply may ultimately be served from the same mains with incandescent lamps, as practical experience seems to indicate that 500 volts is about the maximum pressure that should be allowed at machinery directly under the consumers' control, and a three-wire system with 220-volt lamps will give about 480 volts on the outside wires of mains. Until the 480-volt direct current three-wire system comes into use, however, an independent 500 volt motor circuit will be found necessary in many cases.

The high tension series arc lamp has largely disappeared from interior lighting, and the low pressure lamp operated from incandescent mains taken its place.

Several reasons contributed to this change—the independent circuit, the exposed class of wiring, the extra fire and life risk and the uncertainty of service inherent in the high tension series system, have all operated to exclude it from buildings and confine it to out-of-door work. Long distance street lighting remains the one class of service in which to date there is no satisfactory substitute for the high tension series arc, and there seems small prospect of its displacement in this field during some time to come. Whether the direct or alternating current arc will ultimately occupy the commanding position in series arc work is an open question, but in either case the constant current feature remains.

As no practical plan has yet been put into operation by which approximately constant currents can be obtained from either direct or alternating current generators of large capacity without intermediate devices, it seems that special equipment for series circuits must be retained in some form by all stations operating high tension arcs. Above brief review of existing conditions in electrical supply indicates that a large station in the average city will probably find it necessary to furnish to consumers low pressure, direct current on the 3 wire system for incandescent lamps, indoor arc lamps and motors low pressure alternating current for incandescent and arc lamps and motors, 500-volt direct current for motors and high pressure constant current, either direct or alternating for series arc lamp circuits. As is well known, the effort to furnish all or even a part of these various currents in the past has resulted in station equipments made up of numerous, small, dissimilar units, incapable of either multiple operation or of being satisfactorily driven by a few large economical engines.

During the past two years a strong tendency has been at work toward a reduction in number and uniformity in character of central station units, in order to work all main generators in multiple and concentrate the entire load at any one time, whatever its character, on as few

engines as possible, thus insuring the greatest economy in steam consumption and the highest reliability of operation. Where but one pressure and kind of current is wanted this plan is as simple in operation as it is ideal in conception, but as the consumers rather than central station managers ultimately select the classes of service required it may readily come to pass that a central station under the new plan will have more than three times the capacity of electrical equipment engaged in carrying some parts of its load, that was necessary under the old plan and be saddled with nearly a proportional increase of losses in electrical machinery. Of course, the greater steam economy and more perfect reliability may more than offset the greater first cost of the electrical equipment and its lower combined efficiency, but it certainly seems desirable to maintain the amount of auxiliary electrical equipment and the corresponding losses as low as possible.

In the new stations designed on the plan of uniform units the locations of auxiliary electrical apparatus rightly vary according to the position of the main plant. Where the generating station is so far from the principal load area that a high pressure must necessarily be used to reach it with a reasonable outlay for conductors, the first problem is really one of transmission, and therefore quite different from the frequent case where the station is at one side of or surrounded by its heavy load area. It is at once obvious that a generating station so distant from its load area as to require a high transmission pressure should contain only the equipment necessary to generate the high pressure currents, leaving to the sub stations the auxiliary apparatus necessary to generate the several kinds of current for distribution circuits. When located so near the great bulk of its load that high pressure for transmission, except to outside districts, is not desirable, the generating station will usually contain a large part of the electric auxiliaries as well as the main dynamos and engines, and it it this common sort of a station that requires the best engineering judgment in the selection of apparatus.

Consider, for example, a central generating station so near a large part of its heavy load area that a low pressure direct current is desired for a large per cent. of the total capacity, this direct current to be distributed at about 240 volts on the 3-wire system to incandescent and arc lamps and motors.

Let there be a further direct current load of 500 volt motors over an area too wide for the 240-volt system, also a large series arc lamp load. Surrounding the area served by low pressure direct current mains assume a large amount of business that can best be reached by alternating currents and transformers. On the basis of similar generating units, as commonly installed, the main dynamos, direct connected to their engines, will be of either the alternating current or the direct current type, and the necessary auxiliary motors and generators or converters will all be installed to change the energy delivered by the main dynamos to the forms desired for the several classes of distribution aside from that supplied directly from the main dynamos. Suppose that the main generators are selected of the alternating current type, and of a pressure suited to supply transformers in the outlying districts, then there will be necessary at the station the following auxiliaries :

Rotary converters and transformers for the 440-volt 3-wire system.

Rotary converters and transformers for the 500-volt motor system.

Transformers and rectifiers or motors and arc dynamos for the direct current arc lamps.

If direct current is decided on for the main generators the auxiliary machinery will include :

Rotary converters and transformers for the alternating current high pressure system.

Motors and arc dynamos, or other devices for the arc lamp load.

In this case the 500-volt motor circuit may be operated from two of the main generators connected in series, though but one of these two may work in multiple with the system at the same time, this method being possible through the use of 240-volt generators to feed into the two outside wires of 3-wire mains.

Whether alternating or direct current main generators will operate a given system with greater economy under above conditions of load depends on a number of circumstances, as the relative amounts of the direct and alternating current service and the means employed to generate the high tension arc current.

Storage batteries were not included in above list of auxiliary apparatus, because equally desirable with either arrangement. In the station with main generators of the alternating type, there must be for each kilowatt capacity of direct current for the 3-wire and 500-volt motor systems, at least three kilowatts capacity in main generators, transformers and rotary converters, combined, and from two to three kilowatts total capacity in main generators and transformers, or motors and arc dynamos for each kilowatt capacity of constant arc current.

The capacity for alternating current is represented at once by the capacity of the main alternating generators.

With main direct current generators, high pressure alternating current can only be produced by a station capacity in generators, rotary converters and transformers of three times the alternating current output. With ordinary arrangements the combined capacity concerned in the production of high tension arc currents will be three times their output. In direct current capacity, generators and station for this case coincide.

Whatever the advantages in steam consumption per unit of output from main generators, there is certainly little that represents simplicity, low first cost or economy of operation from an electrical standpoint in the use of 3 kilowatts capacity of electrical machinery to do what one kilowatt capacity did before, and it seems hardly possible that a system requiring so many auxiliary units and transformations represents the final solution of the central station problem.

Perhaps the first solution to suggest itself for these disadvantages is in the use of a few large direct connected units, part being of the direct and part of the alternating current type ; but this violates the essential idea of units interchangeable on any part of the load, and all working in multiple unless the rotary converter with its transformer is again introduced, and this last arrangement brings matters again nearly to their present position. There is apparently but one other direction in which to seek betterment of these latest conditions. Generating capacity having been concentrated in a few large units, each of these units must be given ability to produce either or both of the two great classes of current, alternating and direct—that is, they should be direct alternating generators.

In the station outlined above let each main generator be able to work at full capacity, as either alternating or direct current, and therefore capable of multiple operation with any of the others, on either kind of supply, let each generator also be able to supply a part of its capacity as direct current and a part as alternating current at the same time. If now the direct current side of each generator is designed to operate at either 125 or 250 volts for the 3 wire system and the 500-volt motor circuit, the rotary converter is no longer necessary, and the output of constant pressure direct current is equivalent to the generator capacity thus engaged. This saves equivalent capacities in transformers and rotary converters over the case where the main generators are for alternating current only. To produce low pressure alternating current the same generators that work on the direct current mains are employed, and any desired alternating pressure obtained by means of transformers, thus saving the cost of and losses in the rotary converters necessary when the main generators produce only direct current. The only decided advantage as to the series arc lamp service with this combined type of generator is that all of the combinations possible for its production with either alternating or direct currents are available. Its saving in first cost, efficiency and floor space seem to warrant a prominent place in modern central stations for the direct alternating generator.

Coatings for Cast Iron Pipes.

[By Mr. Thomas H. Wiggin, in *Gas World.*]

It is probable that nearly every engineer who has had a large number of pipes to lay has resolved that he will do something to dispel the mist that hangs about the subject of preservative coatings. Very many seem to have made concoctions of coal tar, asphalt, linseed oil and other things, in the endeavor to strike the fortuitous combination of cheap products which would adequately protect the metal. If all these experiments could be published the engineering world might finally arrive at a choice by rejection. As it is, the same ground is covered several times over with the same disappointing results.

The first subject of importance is a description of coal tar coating. The apparatus consists of a number of ovens, with iron cars on which the pipes are rolled into the ovens, and on which they stand during heating ; a vat or tank for the coating compound ; a crane for hoisting the pipes in and out of the vat, and various brushes, scrapers and mops for brushing out dirt and removing surplus coating material. The coating material is crude gas tar with sometimes some dead oil of tar added. The pipes are given a fairly good brushiug before being put in the oven. The oven is merely an enlarged chimney flue, for all the smoke and gases of combustion pass in at one part and out at another, so that a light but visible deposit of soot is made on the pipes, which is not brushed off. The pipe is left in the oven until the attendants think

(no thermometer is used) it is heated to about the correct temperature (48-inch pipes are left in about 20 minutes;) then it is put in the tar to stay from a moment to 10 minutes, according to the condition of the work about the vat. On being removed from the vat, the pipe is allowed to drain over the vat, and the drainage is aided by scraping the invert with a segmental hoe, made to fit, or at least to be of smaller radius than the pipe. The pipe is then lifted out on to the skids, and the coating smoothed up further—surplus tar removed and thin places reinforced—by a brush or a mop. The brush is better, because the mop leaves part of itself behind on each pipe. The coating becomes hard in from ½ to 2 hours, according to conditions.

The degree of fluidity of the tar varies with the composition and with the temperature. In summer, tar is usually more fluid than molasses; in winter, it has often to be melted out of the barrels. This crude tar cannot be used as a paint for cold surfaces, because it will not harden; tar from the coating vat, though always somewhat refined by the continued heating, does not harden sufficiently when applied to cold surfaces. This suggests the philosophy of the whole tar process of coating. By the heat of the pipes the tar is distilled down to a compound which is solid at atmospheric temperatures. A very favorable condition for this volatilization of the liquefying constituents (which are also the most volatile constituents) evidently exists when the tar is exposed to the air, spread, as it is then, in a thin film over the hot pipes; and that rapid volatilization takes place at this time is indicated by the dense fumes given off.

As a corollary to the foregoing, it follows that the temperature of the pipe, as it emerges from the tar bath, is one vital factor in the character of the coating. If the pipe is too hot, the coating is overdistilled and becomes too brittle, or may even be reduced to earthy, carbonaceous residuum. If the pipe is too cool, a thicker coating is formed, which will not harden sufficiently, will come off on the skids, and will run in warm weather. Thin pipes must be heated hotter than thick pipes, because the thin metal does not hold the heat so long, and hence the distillation must be more rapid at first. The writer made an attempt to measure the temperature of some pipes just before they were dipped. An ordinary thermometer was, of course, of no use, nor could an electrical device be found which experts would recommend to record such low temperatures. Hence the writer procured several chemicals which are said to pass through noticeable changes at certain fixed temperatures. The only conclusion that could safely be drawn was that pipes, just before coating, are usually considerably over 300° F. With tar and thickness of pipe so variable, the proper temperature must be a matter of judgment on the part of the dipman. A reliable and handy pyrometer would help, however, as it would enable the dipman to use the experience gained on one pipe in judging of the next one.

There is no question about the importance of having ovens properly arranged to heat the pipes uniformly. The brick fire arch, having bricks left out at intervals all along the position of the pipe, is rather satisfactory. The single opening at one end of the pipe is decidedly unsatisfactory. The soot that is deposited on the pipes may do some harm. More elaborate and more nearly perfect schemes for heating pipes will quickly suggest themselves, but it seems probable that a careful application of the present methods will give results as satisfactory as a crude tar coating warrants. Careless application will vitiate any method. A good dipman will not allow very noticeable errors in temperature to pass, but he will not delay the routine for minor errors. In other words, the application of the method is inferior to the best judgment of the dipman.

The character of the tar in the bath is another important variable. New tar gives softer coatings, other things being equal, because it contains more of the lighter constituents. Thick tar gives thicker coatings than thin tar. The temperature of the pipe should be varied to meet variations in the coating compound. Fresh tar requires a hotter pipe than does old tar. Regularity in adding new tar would give greater uniformity in coatings.

The temperature of the tar itself does not count for much when the pipes are heated before being dipped, as is universal now. In the old method of heating the pipes by allowing them to remain in the dip half an hour or so, the temperature of the dip was very important, though less so than it would have been with crude tar. The temperature of the tar in the present method is usually about 220° to 230° F. Observations of men at the foundry on temperature of the dip, and the writer's observations on small quantities of tar, indicate that new tar, on account of the lighter constituents, does not at first rise above 220° F. Later it rises to 350° F., if heated sufficiently. It is evident that the old method of allowing the pipes to come to their proper temperature in the dip would lead into difficulty if the crude tar was fresh in the tank, as it would be difficult or impossible to raise the pipes to the required 300° or more.

Joints for Cast Iron Pipes.

A writer in *Metal Worker* says there is probably no more inviting field now open to the inventor than that which is created by the demand for better methods of joining cast iron pipe than are now known and practiced. To meet the requirements of general use, a joint must be reasonably cheap, and applicable to pipes as they come from the sand. Tool work of any kind would render them too expensive; and, like the pipe, the coupling must be of cast iron. To be accepted as a substitute for the hub and spigot joint it must be either cheaper or better. To render it cheaper would be difficult, if not impossible; but the advantages of a better joint than that which can be made by means of calked lead are so great that economy becomes, within reasonable limits, a consideration of secondary importance.

The objections to the calked joint for gas mains apply in part to such joints in plumbing practice, but as the requirements in housework are fewer and less arbitrary than in the case of gas distribution, the problem of a satisfactory joint in iron soil and waste pipes would appear to be much simpler and easier of solution. The calked joint is the weak point of modern plumbing practice. In the examination of a building the experienced sanitary inspector always looks first for defective joints in the main lines of iron pipe, and rarely fails to find them. Not only is it a matter of no little difficulty to make good joints by the present method, but defects due to lack of skill or to carelessness on the part of the plumber are readily concealed and very difficult of detection.

In housework cast iron pipes are run in places not always easy of access, and, in passing, the plumber is under the necessity of often working in very awkward positions. When this necessity confronts him his gasket of oakum or paper, or whatever else is handy, is usually so disposed in the lead space of the joint as to insure that the lead will meet on the side opposite to that at which he pours. If a mechanic of experience, he knows that unless he can pour quickly the metal will chill and set before it has filled the hub. Consequently, the gasket is so arranged as to give a comparatively deep pocket in front, where the lead is poured, and a shallow space behind, where the streams of molten metal, flowing around the pipe, are to meet and unite. Where it is difficult to pour, it is even more difficult to calk. This fact accounts for much of the slighting of joints in housework; but even when every care is taken to make a good joint the lead is very seldom of equal depth all around the joint. The writer once had occasion to remove from a large number of 8-inch and 10 inch tubes the cast couplings which had been attached to them by calked lead joints. These joints were made in the mill, under very favorable conditions for both pouring and calking. The work was entrusted to good men, under competent superintendence. Since the castings were too light to be serviceable, and as scraps were as valuable broken as whole, they were broken off to save time, leaving the lead collars encircling the pipe ends. In not one case in fifty was a leading found to be even approximately equal all around. Some were two inches deep on one side and one-half inch deep on the other. Such inequalities are often found in housework, and to avoid them calls for more of skill and honesty than this class of work is usually supposed to demand. Thorough calking insures temporary tightness, if delayed until the joint has cooled to atmospheric temperature, but the slightest movement destroys this quality and gives us a defective and leaky joint.

The writer once witnessed an experiment with the calked joint which was instructive. Two short pieces of pipe, one having a hub end and the other a spigot end of the usual form for 6-inch water pipe, were set up on a shop floor under conditions favoring the making of as good a joint as possible. An open gasket was packed in, and the lead so poured as to insure the equal filling of the space provided for it. It was calked after setting and recalked when quite cold. This work was done solidly and well, and nothing was neglected or slighted. The joint was then tested, and with a little supplementary calking made "as tight as a bottle," under a pressure of 400 pounds to the square inch. The work was then laid aside, care being taken that it should not be reached by the sun nor in any way disturbed. Just before the works closed down for the day it was retested. With the first stroke of the pump the water flew in every direction, and the gauge returned to zero as rapidly as the copious and increasing leakage would permit. The demonstration was conclusive. It showed that a calked joint could not be made which would remain tight under such slight contraction and expansion of the iron as was due to the difference between an atmospheric temperature of about 84° and water at about 72° F. The range of temperature to which house pipes are subjected is much wider

than this, and the transitions are often quite sudden. It is not surprising, therefore, that even in good work we find defective calked joints. That the plumber is not always, if often, to blame for such defects may be the more readily admitted, since he could not so make his joints as to warrant him in insuring them through 24 hours of use.

What is needed for the satisfactory joining of cast iron pipes of the kind now standard would seem to be an elastic, indestructible substance adhering strongly to iron, and flexible enough to admit of more or less disturbance without rupture or fracture. It must, of course, be tough and strong, insoluble in water, and not affected by gases. In some respects lead comes nearer to meeting these requirements than any other known substance, but it falls far short in others. That nature has not given us, ready made, such a material as we need is probable. Whether it can be produced, who shall say? Failing to find it, the task of the inventor who would seize the opportunity here offered is to give us a new form of joint for cast iron pipe in which lead will do better work than can be expected of it as a packing in the hub and spigot joint.

The Control of Air Currents in Gaseous Mines.

The distribution of air in a gaseous mine requires a mode of treatment that is not necessary in a non-gaseous one; for not only must the quantity be greater proportionally for a gaseous mine, but the velocity along the working face must be sufficient for the removal of the gas. It is impossible in a large mine to split the air so continuously as to supply fresh air for every room, as by so doing the velocities of these split currents would be totally ineffective in the removal of gas from the face, especially of the upgrade rooms. Splitting, therefore, should cease in a gaseous mine when the velocity is becoming too low for the removal of gas. Main air current splitting should, however, be made as frequent as the working conditions of the mine will allow, for, by reducing the main current resistances in this way the pressures required for the local currents in the workings are easier maintained.

In gaseous mines the current resistances of the main airways should not exceed those of the airways of the workings, including the resistances due to constrictions through regulators, cross-cuts and the narrow sides of brattices.

The velocities on the main airways should not exceed, under unfavorable conditions, 1,000 feet per minute, as otherwise it is difficult to locate in the upgrade workings sufficient pressure for the removal of gas. Large quantities may be obtained through high resistances with high pressures, but if the transverse sections of the main are too small the current pressure is expended wastefully and the control of the air is lost just where it is most required, namely, in the workings.

The ideal of good ventilation is a large quantity passed through the main airways at a relatively low velocity, and yet with a pressure sufficient to effectively remove gas from the workings. In long-wall working the best results are obtained by advancing the face upgrade.

Where the seam is giving off much gas, it is interesting to observe how the bearing of the face has to be altered to keep it clear of gas, for it has not only to make an angle of about 20° with the line of strike, but the ventilating current has to be made to move from the lowest to the highest end of the face and there enter the return airway, carrying with it all the gas escaping from the gob, and liberated by the coal of the working face. If the direction of the face coincided with the line of strike, gas would always linger by the face, as the face current becomes diffused through the gob where there is nothing to impede it as the face timbers do.

To fully realize the importance of an upgrade ventilation along a longwall face subject to the presence of much gas, suppose the current to be made downgrade, that is, let it enter at the highest end of the face and leave at the lowest; then gas will collect all along the face and to such an extent that all work will be stopped, as the heavy air will gravitate into the gob and leave the lighter gas the sole occupant of the region of the face. It is, therefore, clear that the safety of the men engaged in working at a longwall face that is subject to the presence of much gas, is dependent on the proper control of the face ventilation. The safe ventilation of the working face requires considerable skill as the very varying conditions all require special treatment; for example, suppose a panel of rooms to be so well ventilated that gas can scarcely collect along the working face. This, at first sight, appears to be a case in which the ventilation is perfectly satisfactory, and yet is imperfect in relation to another condition; that is, one in which the air is highly charged with very inflammable coal dust produced by machine cutting. As long as the air is saturated with dust the ventilation must be considered insufficient, for the workings cannot be considered safe when the air is in that condition. The fact of the presence of so much dust in the air suggests the necessity of a swifter and more voluminous ventilation; but a swift current of air suspends more dust than a slow one; therefore, such a remedy is worse than the disease. The question, therefore, arises, Can anything be done to prevent the air becoming so heavily charged with dust? The answer is, Yes; but the remedy must be made to fit the conditions. The following are the remedies for the supposed conditions:

(*a*) If the rooms are grouped in panels for ventilation, then the air arriving in the last rooms will be in a dangerous condition; for the suspension of fine easily ignited dust will accumulate from room to room if more than one machine is used in the same panel, until, if shots are fired during the period of machine cutting, at one time or another an explosion produced by a small percentage of gas and a high charge of dust is sure to occur in the last rooms of the panel. The remedy is, either split the panel into two or three separately ventilated groups, or lay the dust with water sprays applied in every unstopped cross-cut.

(*b*) If the rooms are ventilated in complete panels, the dust should be arrested by a water spray exactly where it is produced at the undercut.

(*c*) Where a lamp shows a cap of 1 inch, machine cutting should be stopped at once, otherwise an explosion may occur, as it requires very little dust in air to make 4 per cent. of gas explosive. All coal mines are not equally gaseous, nor are all the districts in the same mine and in the same seam equally gaseous, but it generally occurs that the quality and ignitibility of the dust is the same everywhere within the compass of the seam, in an ordinary mine.

Some New Electric Meters.

The *Electrical World* says that among the more interesting of the recently issued United States patents are five on electric meters, three of which are on new forms of maximum demand meters. A patent by Prof. Elihu Thomson describes a system of electric metering whereby the rate at which the meters register is controlled, independently of the speed of the motor mechanism, from the central station or any distant point. The usual form of meter is provided with two registering trains and dials. One of these trains may record continuously and the other is thrown in and out of circuit from the controlling point whenever desired. A normally idle wire extends from the controlling point to the meters which are to be controlled. When a current is sent through this wire a magnet is actuated and by means of a ratchet motion is thus given to a cam which in turn engages or disengages the second registering train from the worm on the meter shaft. If desired, either recording mechanism may be detached from the meter shaft when the other train is engaged, and one train may be geared to give a slower rate than the other. In a patent issued to Rudolph M. Hunter, a system is described whereby a meter may be made to record a higher figure for a given current consumed when the station is heavily loaded and may also be made to record faster when the consumer's load passes beyond a predetermined point. These two actions may occur at the same time, or a meter may be supplied with mechanism for one only. By means of an electromagnet actuated from the central station, either by hand or clockwork, resistance is cut out of the armature circuit of the meter, thus causing it to register faster. To obtain registration for abnormal loads on the consumer's circuit, a solenoid in such circuit throws into action an electromagnet which cuts resistance out of the armature of the meter, thus causing it to run faster.

In a patent issued to W. C. Fish a time element is introduced into the maximum demand form of meter. The recording hand of the maximum demand meter is also the hand of a clock. In connection therewith is an ammeter, and when the ammeter needle is sufficiently displaced by current flowing through the ammeter coils to cause this finger to come into contact with the recording hand, a local circuit is closed and a magnet releases the clock movement; the needle and the recording hand then move together slowly along the dial until the latter leaves behind the ammeter needle, which opens the local circuit and causes the clock to stop. Another patent of the same inventor is on a method for eliminating the effect of friction in meters. On the meter shaft is a second armature in series with the meter armature, and working in the field of a permanent magnet. This field is adjusted by movement of the magnet so as to be just sufficient to neutralize, or a little less than neutralize, the starting friction of the meter—that is, keeping the meter just on the point of starting when no current flows in the series coils. This auxiliary armature may form part of the damping disk, and work in the field of the damping magnets. A patent granted to Caryl D. Haskins

describes a meter arrangement whereby the amount of energy delivered from a storage battery and also the amount remaining in the battery will be indicated without requiring calculation on the part of the attendant. Connections are also shown whereby the charging source is thrown out when the meter shows the battery to be fully charged; also an arrangement of circuits whereby withdrawing a plug cuts out the motor of, say, an automobile, and at the same time change the meter rate—replacing the plug causing the reverse action. In circuit with the meter armature is a resistance, the short-circuiting of which upon charging will cause the meter to accelerate its rate of registration. This resistance may be selected to accord with any battery efficiency. As the meter registers in one direction in charging and the opposite direction in discharging, a device is also introduced whereby one or another of a set of of meter starting coils is cut in or cut out, the current in one starting coil flowing oppositely to that in the other, the motion of the meter is thus permitted to be reversed.

The Schultze Automatic Gas Igniter.

Mr. K. Schultze, of Berlin, Germany, has patented an automatic gas igniter, which consists of threads of cotton or like material impregnated with nitrate of aluminum or other highly refractory soluble earth or earths, the threads being arranged side by side, or formed into bundles, and connected with each other by very thin platinum wires wound around the threads or bundles, or formed into a kind of mesh, so as to represent a metallic web or tissue in which the impregnated threads may be enclosed. In addition to the nitrate of aluminum or other highly refractory earth or earths, the threads may also be impregnated with a solution of glaze platinum, that is platinum free of chloride, the so-called glaze platinum being a compound formed by the combination of freely divided and distributed platinum and bituminous substances, especially fossil resins.

If a bundle with such threads is heated to about 75° C., and is then brought in contact with illuminating gas, the threads commence at once to glow intensely, and ignite the gas. To heat the bundle of threads to the temperature mentioned, one of the threads may consist of sponge platinum or be impregnated with a solution of sponge platinum, or a certain quantity of spongy platinum may be secured to the bundle of threads as a separate piece.

Most earths, such as aluminum, thorium, zirconium, and the like, combine with each other at white heat and in the presence of metallic platinum in such a manner that they incorporate the platinum in a finely divided state at the place of contact with each other, the fine division of the platinum resulting probably from an evaporation of the same, as the finely divided platinum remains alloyed with the earth or earths as long as it remains in contact with the exterior metallic platinum; but when this contact ceases, the platinum spot disappears, in consequence of the continuation of the white heat which is the reason that with the hitherto automatic igniters based on the behavior of the earths named the desired effect ceases after a comparatively short time. To keep the automatic igniter lastingly able to produce the effect desired, or, in other words, to prevent the fine particles of the alloyed platinum from losing contact with the exterior metallic platinum, the fine platinum wires (that are wound around the bundle of threads) have been provided, the object of these being to always replace the platinum consumed by evaporation. In order, however, to continually maintain the precipitation of the platinum upon the base or body of the earth or earths, it is important that the platinum has no earthly cover, but that it should be perfectly clean, as otherwise there cannot be the proper contact between the platinum and the earth, and the effect would not be obtained with certainty. In any case, it is not important that the threads be straight, as they may well be twisted together, so as to form a kind of cord, and also the platinum wires may be twisted together with the threads.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the Concord (N. H.) Gas Light Company the following officers were chosen: Directors, L. D. Stevens, Jno. Kimball, Henry McFarland, F. A. Stillings, Jno. P. George, Benjamin C. White and Jno. M. Mitchell; President, L. D. Stevens; Treasurer, John Kimball; Secretary, Sylvester Dana.

The proprietors of the Northwestern Gas Light and Coke Company, of Evanston, Ill., have issued the following circular respecting a concession in the selling rates: "Beginning with October 1st, bills will be rendered for gas at $1.25 per 1,000 feet, subject to a discount of 10 per cent. for gas used for lighting purposes and 20 per cent. for gas used for fuel, making net prices of $1.12½ for light and $1 for fuel. Within the past year this Company has largely increased its facilities for making and distributing its product, and has added to its equipment an entire new purifying plant, thereby enabling it to furnish to the public a gas unsurpassed in quality and ample in quantity to any demand that can be made upon it."

We are informed that a gas plant is proposed for Bennington, Vt., and that those mainly interested in the project are Messrs. Collins M. Graves, William A. Root, George F. Graves and C. Welling Thatcher of Bennington, and Col. Frank S. Richardson, of North Adams, Mass. The Bennington Light and Power Company is doing the public lighting by means of electric lamps, and the current contract has five years to run. Bennington is a post village of a similarly named county in Vermont, and is located on the old Bennington and Rutland Railroad, at a point about 55 miles south by west of Rutland and 35 miles northeast of Albany, N. Y. It is an important manufacturing center and steadily grows in population and prosperity. Bennington proper numbers not less than 5,000 residents, and the nearby villages of North Bennington and Bennington Center certainly have not less than 2,500 residents. A gas works there should certainly prove a source of profit to its owners.

Mr. Alexander Jeffreys, who built the Lexington (Ky.) gas works, in 1854, and who was its president up to a few months ago, died at Lexington the morning of the 1st inst. Deceased was born in Scotland in 1815, and settled in Lexington in 1853. With his brother, R. F. Jeffreys, he was concerned in the construction of the original gas plants in Nashville and Memphis, Tenn., and in Havana and Matanzas, Cuba. He is survived by a son and three daughters.

James L. Buford and others have applied for a franchise to contract and operate a gas works in Abilene, Kas. They offer to furnish gas at $1 per 1,000 cubic feet, and agree to complete the plant in 6 months. We believe that Mr. Buford is a resident of Kansas City, Mo.

We are informed that the Baldwin Gas Company, of San Francisco, Cal., has been incorporated by Messrs. Adolph Feist, Charles M. Baker, J. W. Pauson, A. J. Fritz and J. Early Craig. It is capitalized in $400,000.

Mr. George E. Senny, of Tiffin, O., has purchased the properties of the Norwalk (O.) Gas Light Company.

At the annual meeting of the Hollidaysburg (Pa.) Gas Company the officers chosen were: Miss J. Guess Ditting, Miss Kate M. Stewart, J. A. B. Melvin, Edwin R. Baldridge, Wm W. Brown, T. J. Baldridge and R. C. Irvine; President, Miss J. G. Ditting; Secretary and Treasurer, Miss Kate M. Stewart.

Mr. P. A. Trullinger, Secretary of the Astoria (Oregon) Gas Light Company, has issued the following schedule of prices that will rule in Astoria for the commodities mentioned, until further notice: Coke, in quantities less than 1 ton, $8.50; in quantities over 1 ton, $8 per ton; tar, per barrel, $7; tar, in 5 barrel lots, $6.50 per barrel.

A correspondent in Oshkosh, Wis., writing under date of the 6th inst., says: "The application of Mr. William Mainland and others, for an opposition gas franchise in Oshkosh, Wis., was laid on the table by the Common Council of that city, on Tuesday night, the 5th inst. Mr. Mainland resigned his position as Manager of the Oshkosh Gas Light Company, May 10th, and two days later published his application for a competing franchise. The Oshkosh Gas Light Company, however, was willing to meet all the reductions and concessions offered by the new concern, and, under the circumstances, it was voted to extend the privileges of the old Company until the year 1933. This chronicles another victory for the legitimate side of the gas business."

It may be accepted as a fact that Mr. Walter D. Field has been appointed inspector of gas and gas meters for Newark, N. J. In any event, his nomination, which had been made by Mayor Seymour last month, was confirmed by the Common Council something over a fortnight ago.

The bid of the Suffolk County Gas Company, of Bay Shore, L. I., for the public lighting of the adjoining district of Islip, was as follows:

21 gas lamps, to burn all night and every night, at $22.50 per lamp per annum; 50 lamps, to burn every night until 1 A.M., at $18 per lamp per annum; and 29 lamps, to burn until midnight for 6 months of the year, at $9 per lamp. The named rates cover all ordinary charges for repairs and maintenance and for lighting and extinguishing. Four feet burners are to be used.

THE Philadelphia *Press*, of the 12th inst., says that the Altoona (Pa.) Gas Company and the Logan Valley Electric Railway Company have been sold to Mr. Turner A. Beale, who is said to represent New York capitalists.

THE gas plant at Nelson, British Columbia, which is to be constructed by the Economical Gas Apparatus Construction Company, of Toronto, will it is thought be completed by December 1st. Mr. David Morris has been appointed Superintendent of the Nelson Company.

MR. B. H. STRONG, treasurer and manager of the Baraboo (Wis.) Gas and Electric Light Company, is no longer a bachelor. Mrs. Strong was Miss Mary L. Caldwell. The marriage took place at Waupaca, Wis., early this month. Good luck to them.

A CORRESPONDENT in Scranton, Pa., forwards the following: "A few weeks ago charters were granted to the American Electric Light Company, of Bloomsburg, Pa., and to the American Gas Light Company, of the same place. These companies have purchased all the stock of the the Bloomsburg Gas Company and of the Bloomsburg Electric Light and Power Company, and the same will be operated under one management. The new Company is controlled by Scranton and Wilkes-Barre capitalists. Its President is Mr. W. D. Boyer and its Secretary is Mr. F. B. Russell. E. J. McCabe has been appointed General Manager. W. V. Robbins will be retained as Superintendent of the gas works. The latter will be put in good order, which will involve the expenditure of a good sum of money."

IN addition to the many other contracts occupying the attention of the United Gas Improvement Company it has the following, which contracts are positive evidence respecting the prosperity of the gas business throughout the country. In all of the constructions the Company is installing its standard, double superheater Lowe water gas apparatus:

Name of Company.	Per Diem Capacity of Apparatus.
Consolidated Gas Company, New York city	2,000,000 cubic feet.
Quincy, Ills	250,000 "
Boone, Ia	125,000 "
Webster, Mass	50,000 "
Flushing, L. I	250,000 "

MR. LOUIS DANIEL SUMMERS, for some time Superintendent of the Electric Light, Gas, Heating and Coke Company, of Jeffersonville, Ind., died suddenly early this month, in St. Joseph Infirmary, Louisville, Ky., in which institution he had been placed to be operated upon for a severe case of appendicitis. He was born in Jeffersonville 53 years ago.

THE project of supplying gas "in the regular way" to the inhabitants of Merchantville and adjoining boroughs of the named New Jersey district is again up for consideration.

THE Merced Falls (Cal.) Gas and Electric Company has been incorporated by Messrs George Crocker, C. E. Green, J. D. Bradley, A. F. Morrison and C. H. Shaw. It is capitalized in $250,000.

THE sale of the Matawan and Keyport (N. J.) Gas Light Company, is reported, the Clark interest having been purchased by Messrs. A. P. Bachman and C. A. Geran. Mr. Bachman has been elected President.

THE new foundry for the Benjamin Eastwood Company, Paterson, N. J., is almost completed. The building, which was designed and erected by the Berlin Iron Bridge Company, of East Berlin, Conn., is 92 feet in width by 180 feet in length, and is served by a traveling crane. The wings of the building are controlled by jib cranes. When the structure is completed the Eastwood Company will be the possessor of one of the best equipped foundries in the United States.

A CORRESPONDENT in Galveston, Texas, writes that articles incorporating the Austin Gas Company, of Austin, Texas, have been filed by Messrs. T. B. Cochran and Robert G. West, of Austin; Henry Leer, of Philadelphia; Arthur Heurtly, of Chicago; George C. Robbe, of New York, and others. The articles declare that the corporation is formed for the purpose of "manufacturing, supplying and selling gas for light, heat and power." It is capitalized in $150,000.

THE following is from a recent issue of the Denver (Col.) *Republican:* "The mysterious shooting of William Holshouser, a stoker in the Denver Gas and Electric Company's works, on the night of July 9th, has resulted in a damage suit against the Company. The complaint states that Holshouser was employed at McPhee & McGinnity's lumber yard on June 21, when Superintendent Barker, of the Denver Gas and Electric Company, hired him. Barker promised him a good position and good wages, states the complaint, but said nothing about the strike which was then on at the works. Holshouser went to work the next day as a stoker, being in complete ignorance of the strike. Late at night of July 9th three shots were fired at him from without the stockade which surrounds the works. One shot took effect in his left hip, and another affected his left thigh. He avers that he was confined to his bed for two weeks in consequence and that he suffers great pain and inconvenience from the wounds." Although the perpetrators of the deed were not apprehended, complainant asserts that the strikers were the miscreants. In concluding, the complaint recites that the Company was aware that threats to do bodily harm had been made by the strikers, which threats had been carefully concealed from plaintiff by Superintendent Barker. The Company is also alleged to be liable in that it failed to hire armed guards to protect its workmen and premises.

THE above is a narration of the lawyers who have "retained" themselves to help Holshouser; but it is not likely the case will ever come to actual trial, in that even a Colorado court may be depended upon at the outset to decide that, when Holshouser left the employ of McPhee & McGinnity, he very well knew the strikers were making trouble for the Denver Gas and Electric Company.

A CORRESPONDENT in Los Angeles, Cal., says that a controlling interest in the Santa Ana (Cal.) Gas and Electric Company has been purchased by the Edison Electric Company, of Los Angeles, through the purchase by the latter of the shares owned by the late Mr. C. M. Holmes.

MR. B. F. BLASHER, Secretary of the "Northern Light Wood Gas Company," applied recently for the right to maintain and operate a wood gas plant in Tacoma, Wash. The Common Council, after due consideration of the subject, decided that he might have the right "to place his wood gas machines on the premises of any individual patrons that he could secure."

AT the next town meeting, Revere, Mass., the voters will be called upon to ballot a second time on the proposition to establish a municipal gas plant. On the first balloting 133 votes were cast in favor of the project to 2 against.

MR. J. J. RUSSELL, Superintendent of the Meridian (Miss) Gas Light Company, died at the Elmer House, Meridian, Mass., the night of the 5th inst. Mr. Russell was well known in Sheboygan, Wis., from which place he came to take charge of the Meridian works.

AT the annual meeting of the shareholders in the Malden and Melrose (Mass.) Gas Company the officers chosen were: Directors, F. E. Benson, F. E. Chandler, E. N. Foss, E. A. Hildreth, E. O. Holmes, R. R. Robinson and E. J. Stevens; President, Frank E. Chandler; Treasurer, C. E. Dolley; Clerk, V. W. Mason.

MR. CHARLES A. NEWNING, Manager of the *Southern Industrial and Lumber Review*, writes us that hereafter its main offices will be located in Houston, Tex., instead of Austin.

THE annual outing of the employees of the Jersey City (N. J.) branch of the United Gas Improvement Company was shared in and enjoyed by over 100 persons. The clambake and dinner were served at the "Two Pines," Bergen Point, N. J.

THE betterments on the plant of the Passadena (Cal.) Company are almost finished.

THE AMERICAN GAS LIGHT JOURNAL

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AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, SEPT. 18, 1899.

The Nobel Prizes.

At last the question of the Nobel prizes has been finally decided and definite arrangements have been made. After settling up the estate, it was found that the amount available for prizes exceeds $7,500,000. According to the will of the Swedish inventor, his vast wealth was to be invested and the proceeds distributed to five persons who make the most important discovery or invention of the year. The prizes to be distributed are given annually for discoveries and inventions in physics, chemistry, medicine, and also for the most meritorious work in literature. The fifth prize is to be awarded to the person who has done the best work for advancing the fraternization of nations and for diminishing armies and the propagation of peace. Five institutions, to be called the "Nobel Institutes," are to be created. Each is to be managed by the body to whom the decision was left regarding the prizes, as was originally arranged for by the late Alfred Nobel. Thus the Nobel Institute for Chemistry and the Nobel Institution for Physics will be under the management of the Academy of Sciences of Sweden, that of Philosophy and Medicine will be managed by the Carolin Institute at Stockholm.

The literary institution will depend upon the Swedish Academy, etc. Each of these institutions is to be provided with libraries, laboratories, etc., for the accomplishment of the object in view. Each will dispose of 300,000 crowns, or about $60,000, from which the expenses of administration are to be provided. Each of the five prizes will amount to about $40,000. The first distribution will take place in December, 1901, and the annual date for such distribution is to be the 10th of December, the anniversary of the death of Alfred Nobel. The prizes will be given on the recommendation of those entitled to present candidates, such as the institutions in Stockholm, certain foreign scientific societies, academies, universities and high schools. They can alone make proposals for the scientific and literary prizes, while the Norwegian Diet or parliaments of other nations only can put forth candidates for the prize for the propagation of peace. The proposals must be made in one of the Scandinavian languages or in German, English, French or Latin. No other language will be considered, and personal application will be entirely useless. Each fortunate recipient of a prize will receive a diploma and a gold medal bearing the portrait of Alfred Nobel. Of course, the prizes will be distributed without any reference to the nationality of the contestants.

Acetylene Gas in the Washington Aqueduct Tunnel.

Under the direction of Lieut.-Col. A. M. Miller, Corps of Engineers, U.S.A., two acetylene gas plants are being installed at two of the shafts of the Washington aqueduct tunnel, which is being put into condition for service. The plants are 60 and 300 burners capacity respectively. A report regarding the installations, by Lieut.-Col. Miller, says: "The fumes and smoke from blasting, added to the smoke from torches and lamps, rendered the atmosphere underground, especially when the barometric conditions were unfavorable to ventilation, very offensive and discomforting to the workmen. An investigation of the subject of lighting the tunnel by other means, more especially at the locality where the mechanics were at work, brick and stone masons and the workmen on the iron lining, resulted in the selection of acetylene gas as the most available and economical in this special emergency.

Gas pipes are carried down the shafts from the plants and run along the tunnel, with cocks for burners every 30 feet, and this system suffices for the illumination of the tunnel for a distance of about two miles. Movable lights of several burners are connected with the cocks by rubber hose, and used to concentrate the light in the immediate vicinity of the work, particularly in the cavities behind the old lining."

Commercial Education in Russia.

The *Journal of the Society of Arts* says that education is continually receiving more attention and encouragement in Russia. Not only the government, but also commercial institutions, large firms, and even private individuals, are opening new commercial educational establishments, varying from the engineering college (polytechnic) opened by the government at Warsaw last year, where young men who wish to become civil, mechanical, chemical, or electrical engineers, architects, or surveyors, can obtain a thorough theoretical and practical technical education, to the simple evening artisans' class, designed to give apprentices a certain amount of theoretical knowledge of their trade to supplement the practical knowledge gained at their work. Consul-General Murray says that between these two extremes come commercial schools, where the sons of worgingmen can get a preliminary education at certain trades, such as carpentering, locksmiths, etc.

It thus only remains for the parents, and the boy himself, to decide what line he will take, and how much time can be given to his education, for which facilities are at hand from the time he first goes to school until he has finished at the engineering college at 22 or 23. The two branches of commercial education which appear to be the most neglected, as compared with Germany, are shorthand, it being extremely difficult to get a clerk who can take down a letter in shorthand and then print it off on the typewriter, so common an accomplishment elsewhere, and the careful special training of commercial travelers, which is carried to such a pitch of perfection in Germany, has little attention paid to it in Russia.

The Market for Gas Securities.

The uncertainty about loaning rates was responsible for a lowering all round in the general share market last week, and the tendency to weakness was further promoted by a well-directed drive against some of the miscellaneous properties which are said to be dominated by that doughty financial warrior, Mr. A. N. Brady. When Mr. Brady learns that "Peace hath her victories, no less renowned than those of war," the gentleman will have learned a lesson like that taught to many of his predecessors in the gentle art of financial warring. Meanwhile it is incumbent upon us to report that city gas shares, of the odd-lot description, are lower for the matter of cash transactions on the curb. Consolidated is nominally weaker, although anybody with a fair lot of it to transfer on a cash basis would likely find a customer by applying to the City National Bank. One thing to be said in favor of the latter institution is that its executives never do anything in a hurry. The closing for Consolidated to-day (Friday) was 188 to 196. The dividend rate on Standard common for the last quarter was not changed.

Brooklyn Union is in a wobbly condition, so far as nominal quotations go. It is worth 25 points over its present bid price, provided the gas kings of Manhattan speedily come to their senses. Otherwise it is 25 points too high. Peoples of Chicago is weak, probably because of Mr. Brady's strength. Bay State languishes, and Baltimore Consolidated is without change. The United Gas Improvement Company has declared its usual quarterly dividend of 2 per cent. It is quoted at 336 to 338. A nearer price to its real value would be 400.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

SEPT. 18.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	188	196
Central Union, Bonds, 5's	3,000,000	1,000	107⅛	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	260	300
" Bonds	1,500,000	1,000	100	102

Municipal Bonds	750,000	..	..	
New Amsterdam Gas Co.	13,000,000	100	33	33½
Preferred	10,000,000	100	58	58½
Bonds, 5's	11,000,000	1,000	101½	103
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000		112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	.	
Standard	5,000,000	100	112	118
Preferred	5,000,000	100	135	142
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	143	147
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅜	1⅞
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	40	..
" 1st Mtg. 5's	450,000	1,000	95	98
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	8	9½
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	106	108
Consumers, Jersey City	2,000,000	100	100	..
" Bonds	600,000	1,000	107½	110
Cincinnati G. & C. Co.	8,500,000	100	191½	192
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	63	64
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	99	99½
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	99	99½
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Indianapolis	2,000,000	..	129	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	50	..
" 1st Mtg. 5's	250,000	1,000	96	100
Jersey City	750,000	20	225	275
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	65½	66
Preferred	2,500,000	100	97	103
Bonds	10,000,000	1,000	107	108
Madison Gas & Elec. Co.	400,000	100	82	85
" 1st Mtg. 6's	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	114	115
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	215	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	70	73
St. Paul Gas Light Co.	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co.	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96	99
Syracuse, N. Y.	1,750,000	100	..	13
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,600,000	20	280	..
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	99	100
Bonds, 5's	3,880,500	.	106	108
Wilmington, Del.	600,000		214	..

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OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
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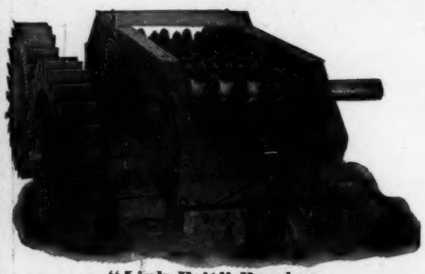

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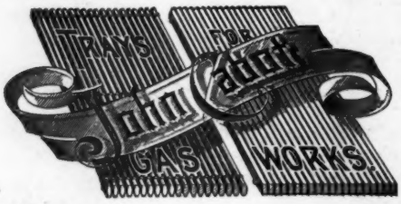

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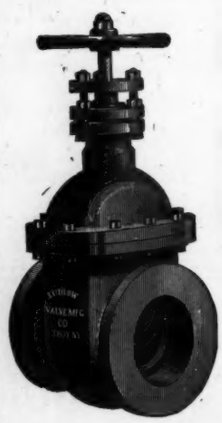

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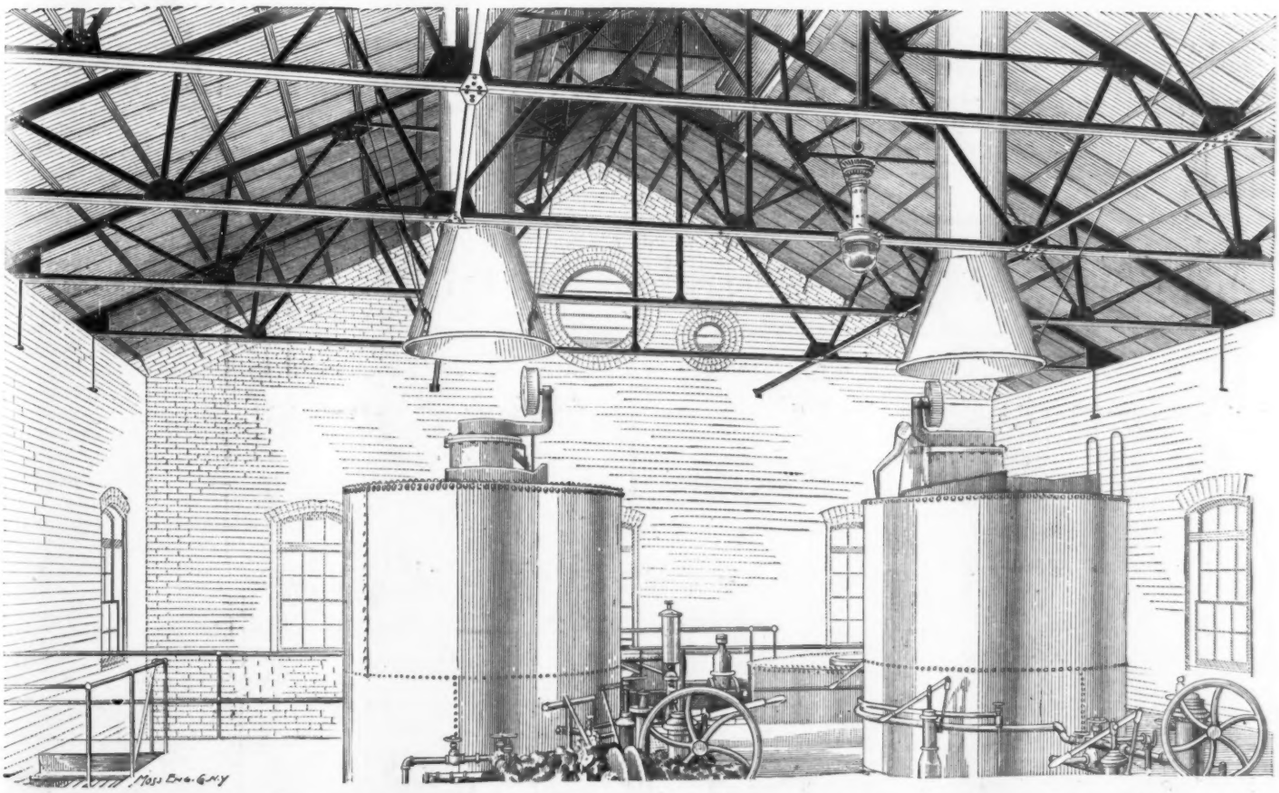

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Providence Gas Light Company, at Providence, R. I. The building is 40 feet in width by 100 feet in length, the side walls being of brick and the roof being entirely of iron—that is, iron trusses and purlins covered with corrugated iron. The building is ventilated by our Improved Ventilator, extending the full length of the roof, with side shutters opened and closed by cords from the floor. No woodwork is used in any way about the construction of the building.

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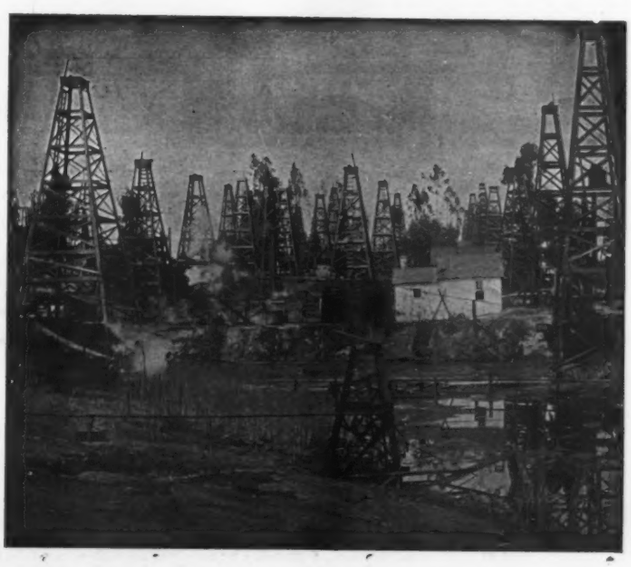

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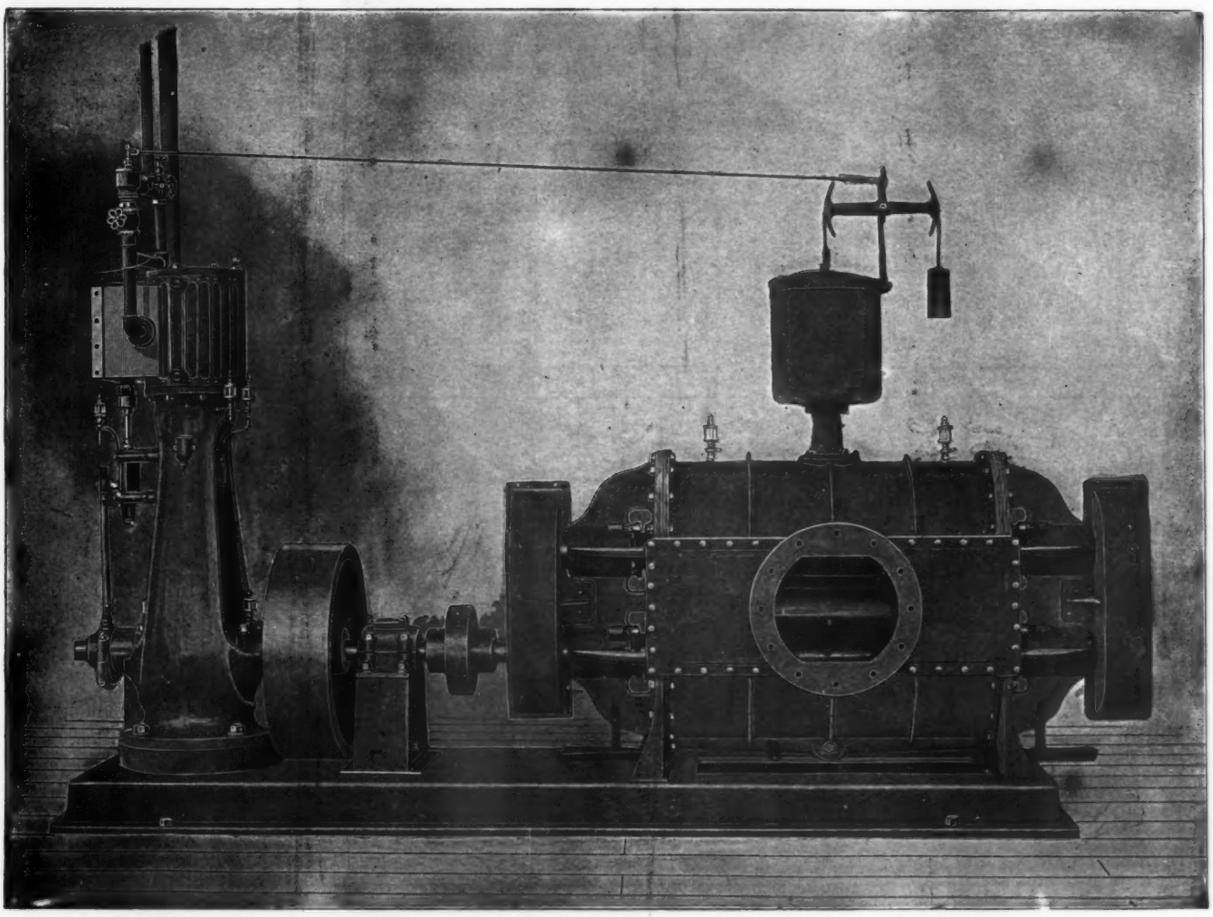

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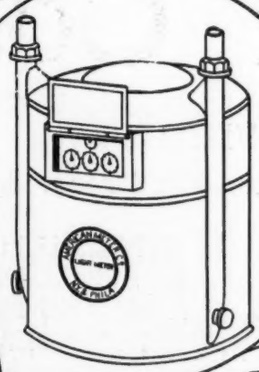

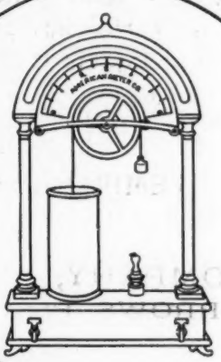

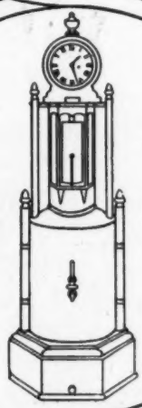

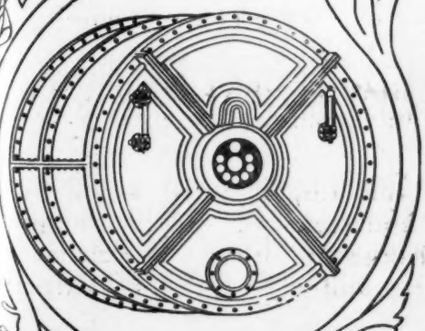

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SAN FRANCISCO.

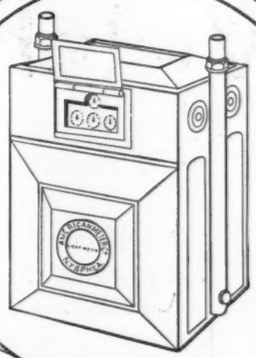
PUBLIC LIGHTING TABLE.

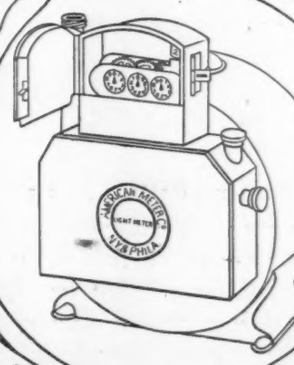
OCTOBER, 1899.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Sun.	1	6.10 PM	5.00 AM	5.30	5.00
Mon.	2	6.10	5.00	5.30	5.00
Tue.	3	6.10	5.00	5.30	5.00
Wed.	4	6.10 NM	5.00	5.30	5.00
Thu.	5	6.10	5.00	5.30	5.00
Fri.	6	6.10	5.00	5.30	5.00
Sat.	7	6.10	5.00	5.30	5.00
Sun.	8	6.00	5.10	5.20	5.10
Mon.	9	7.30	5.10	5.20	5.10
Tue.	10	8.30	5.10	5.20	5.10
Wed.	11	9.40 FQ	5.10	5.20	5.10
Thu.	12	10.50	5.10	5.20	5.10
Fri.	13	12.00 AM	5.10	5.20	5.10
Sat.	14	1.10	5.10	5.20	5.10
Sun.	15	2.30	5.10	5.10	5.20
Mon.	16	3.40	5.10	5.10	5.20
Tue.	17	No L.	No L.	5.10	5.20
Wed.	18	No L. FM	No L.	5.10	5.20
Thu.	19	No L.	No L.	5.10	5.20
Fri.	20	5.40 PM	7.10 PM	5.10	5.20
Sat.	21	5.40	8.00	5.10	5.20
Sun.	22	5.40	8.50	5.00	5.30
Mon.	23	5.40	9.50	5.00	5.30
Tue.	24	5.40	10.50	5.00	5.30
Wed.	25	5.40 LQ	11.50	5.00	5.30
Thu.	26	5.40	12.50 AM	5.00	5.30
Fri.	27	5.40	1.40	5.00	5.30
Sat.	28	5.40	2.40	5.00	5.30
Sun.	29	5.30	3.40	4.45	5.35
Mon.	30	5.30	5.30	4.45	5.35
Tue.	31	5.30	5.30	4.45	5.35

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45





OFFICE OF THE

Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

To the Stockholders of the Welsbach Light Company:

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

THE UNITED GAS IMPROVEMENT COMPANY,
Broad and Arch Sts., Philadelphia, June 23d, 1899.

COL. W. E. BARROWS, President Welsbach Light Company:

Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,

THOMAS DOLAN, President,
United Gas Improvement Company.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

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Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Charlotte, N. C.	1	250,000 "
Consolidated Gas Co., New York	2	2,000,000 "
Quincy, Ills.	1	250,000 "
Boone, Ia.	1	125,000 "
Webster, Mass.	1	50,000 "
Flushing, N. Y.	1	250,000 "
Total	29	18,650,000 "
Previously built	294	187,100,000 "
Grand Total	323	205,750,000 "

Established 1858. Incorporated 1890.
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H. D. ABERNETHY. Sec.

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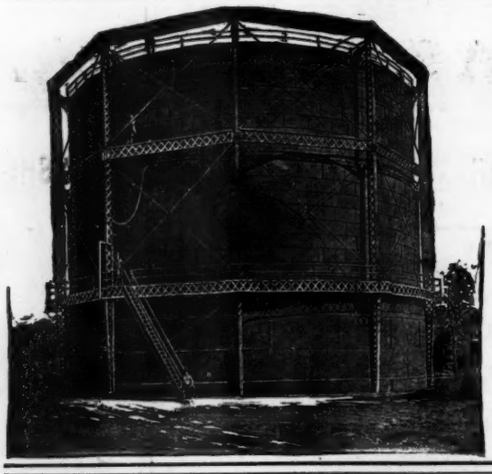

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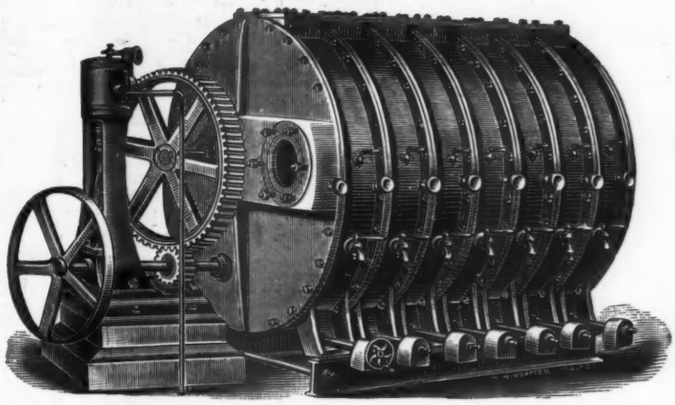

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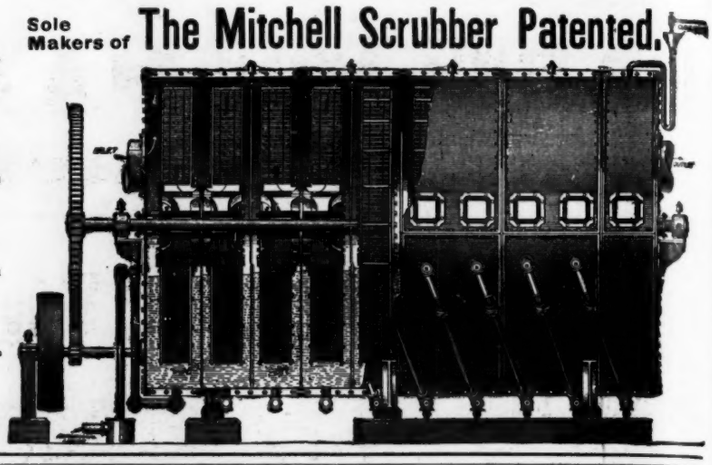

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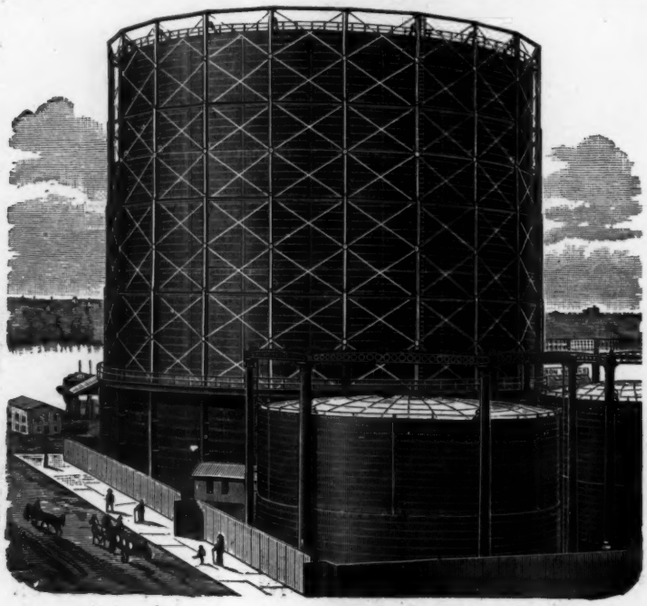

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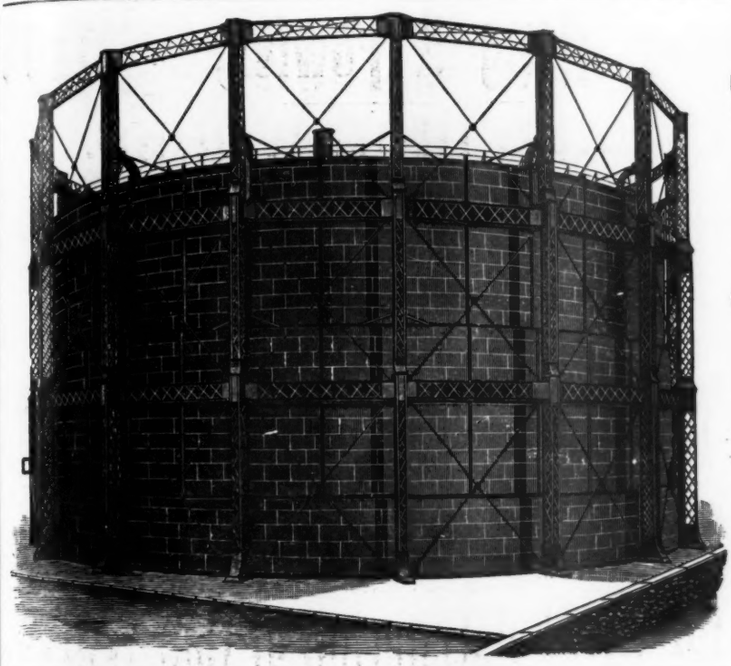

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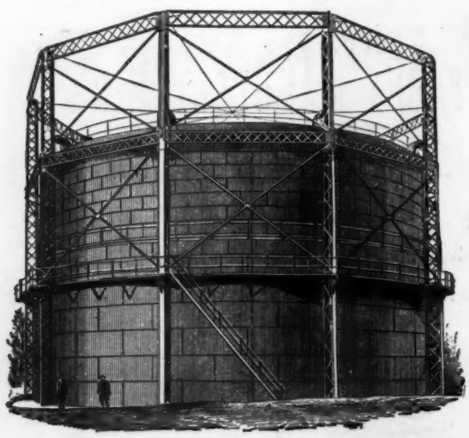

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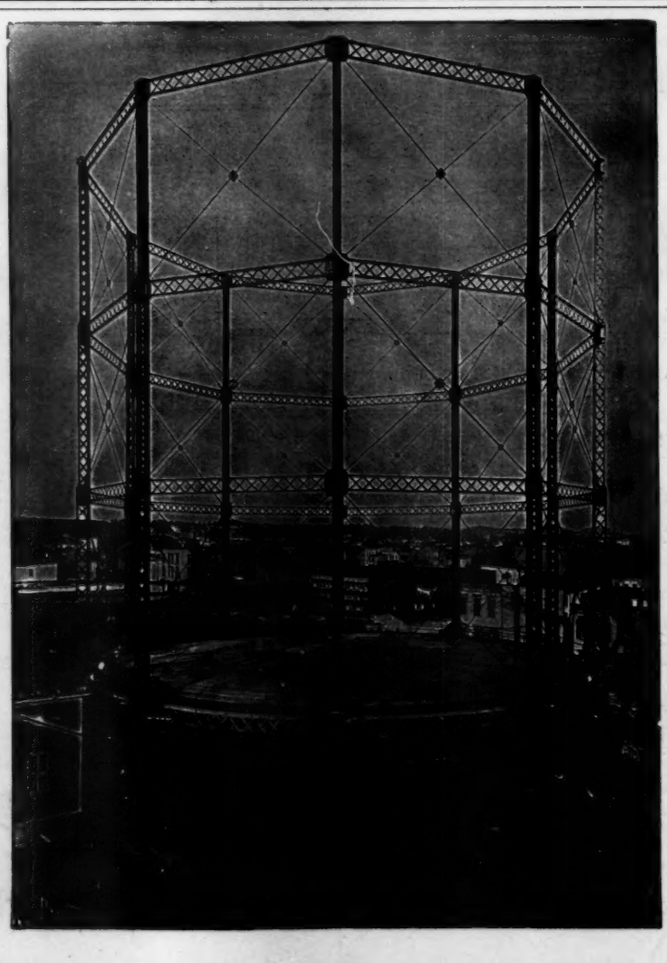

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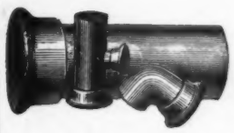

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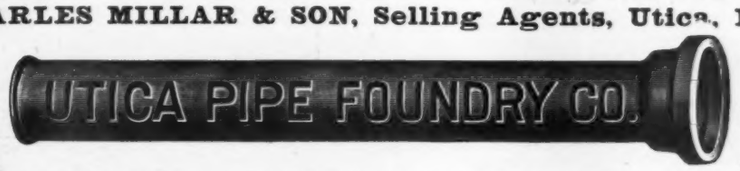

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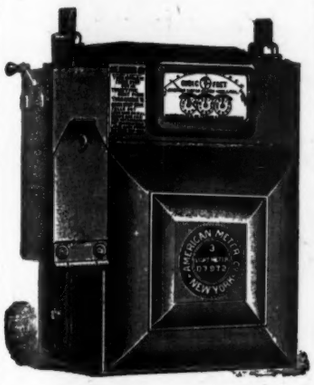

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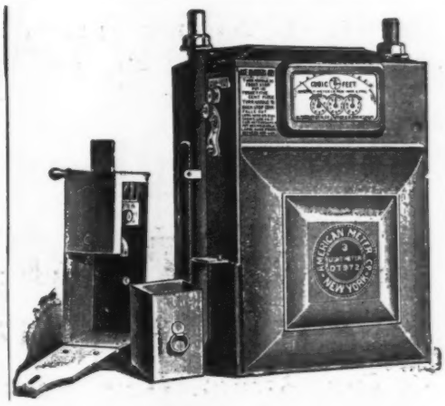

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